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Enhancing Person-Centered Care Through the Use of Technology, presented in partnership with the National Acoustic Laboratories

Presenters: Pádraig Kitterick, PhD, Bec Bennett, PhD, Taegan Young, MClinaud

It is my pleasure to announce our guest speakers for this year's presentation with nal, the National Acoustic Laboratories in Sydney, Australia. Every year Audiology Online hosts a wonderful series with the researchers there at now this year we have Dr. Pádraig Kitterick, Dr. Bec Bennett, as well as Taegan Young. I'll hand the mic over to you now, Dr.

Kitterick. Thank you so much and welcome all to today's webinar. And we're really delighted here at NAL to present to you today on enhancing person centered care through the use of technology. So really delighted to have my colleagues, Bec and taken with me today.

So these are our disclosures and you will also see that these are learning outcomes for today and each talk will identify which learning outcome relates to it as well. So I'm going to start today by talking about the future of audio broadcast and streaming technologies in audiology. And you know, this is an area where it feels like we're undergoing something of a revolution, something of a sort of a change that is going to make a huge difference over the next coming years. And of course, we've come a long way in the past. We will all be familiar with the fact that telecoil has been a sort of a very stable, reliable technology for streaming audio or broadcasting audio to hearing aids.

We've sort of battled in various different ways with the ability to stream audio and connect hearing aids in particular to mobile phones, which has been, let's say, an evolving experience for everybody who has to deal with hearing technology. But we're really at a sort of turning point now where the technology is really changing. Some new things are going to be introduced that I'm going to talk to you about and are already being introduced. And I think this is a really exciting time, but there's quite a lot of complexity to it. And so really delighted to try to bring you through some of the latest advancements and make sure that hopefully after this presentation that you feel comfortable in discussing this presentation with your clients because it's really going to be a key part of accessing audio and streaming technology into the future.

So in this session we're going to talk about some of the technologies that underpin both legacy and modern streaming audio broadcasting systems. You're going to hear about the latest advances in audio broadcasting technology for hearing aids in particular, but these are now making their way, as I will discuss later, to most hearing devices, both prescription and non prescription, and also importantly, the same technology coming to consumer devices. And finally you'll be presented with some data that we at the National Acoustic Labs have been focusing on looking at the benefits of this new technology for users of hearing aids. And so ultimately, we want you to have an awareness of these technologies and how they might be relevant to people with hearing impairment.

So let's just take a step back and think about why audio broadcasting matters.

This, as I said, has been an area where we have primarily relied on either two primary technologies. One is telecoil, which, as everyone will know, has been around for a very long time. Introduced in the late 30s, actually is the first reference that we can see to telecoil technology. And, to be honest, has largely stayed the same since then. Some of the installations have become more sophisticated.

But the fundamental technology, which is to generate an electromagnetic field, having to have a big wire that creates this field. And then having to have a pickup coil within the hearing aids to pick up that field or within an accessory. So that really hasn't changed, and that is really pervasive in, as shown in the picture here, A lot of things like reception areas, for example, of hotels, or in public transport spaces, for example, you will often see the telecoil sign. But importantly, also, it's often the technology that's still relied on in other places where audio is broadcast, such as music venues and concert halls. Now, in some cases, you will still very clearly see the sign for telecoil displayed in those places.

Some places obviously transition to slightly more modern technology, like FM systems or other infrared systems or other wireless broadcasting systems. But something like telecoil still remains a critical technology for a lot of people still relying on it as one of the most primary, most available, most

consistently available broadcast technologies. And that presents quite a significant problem for reasons I'm sure that many of you will be familiar with. But let's just go over those today. The first is that telecoil broadcasts a mono signal, a monaural signal.

So you don't get any spatial representation, which, of course, will be particularly important for the enjoyment of music, as an example. It also is highly dependent on there being this coil that is often had to be designed and built into the systems and into the venues. So it's quite a costly thing. And I know, for example, even in places that take accessibility extremely seriously, often the telecoil or any accessible loop technology is confined to only certain parts of the auditorium. So you have to sit in certain places to be able to access that.

So, you know, even if you've got a very good quality signal, you still got a subpar experience in some cases. And then finally it's the vulnerability to interference. In particular, telecoil is very vulnerable to electromagnetic interference. And it's actually quite a lot of work and quite important that venues that have telecoil put a lot of attention on making sure that the signal does not get degraded over time as they introduce other technologies around it. And often that isn't done.

And often the quality of telecoil signals can degrade over time. Particularly these days as we're living in an environment full of electronic devices where telecoil systems can often be interfered with by those technologies.

So primarily today I'm going to focus on AuraCast. And AuraCast is a really exciting technology which is from Bluetooth. It's a Bluetooth standard. So that's the first thing to be aware of when you hear AuraCast. Think Bluetooth.

Think the same way that you think that Bluetooth is an accessible technology available to us all. It's on all of our mobile phones every we all, I'm sure, have wireless headsets or wireless earbuds that have

Bluetooth in them. Think of this as the latest part of Bluetooth, the latest innovation from a Bluetooth perspective. Now we're all used to Bluetooth being about connecting a headset or maybe a speaker to a source like a mobile phone or a computer. The difference with oracast is that it's a technology built from the ground up to be focused on broadcasting audio out from a source to multiple different devices.

So it's not the same idea that you have to pair a device with a source and you do that one to one pairing and it's not really designed to send that audio to multiple devices. Well, this is the opposite. This is designed to send audio to as many devices as can pick up the signal. So think of it as Bluetooth but for broadcasting. The difference with oracast though as well is that unlike other Bluetooth technologies and everyone here I'm sure will be aware, but a lot of hearing aids until very recently have used often used proprietary technologies.

So if they do streaming, sometimes they will have support of proprietary technologies. There was then some very important moves to standardize those technologies that resulted in the very standard connectivity with iPhone and Android, but still two different protocols. We have two different ways to stream to iPhones and Android as an example. This is a sort of levels the playing field. This starts again and says let's come up with a single standard for broadcasting audio.

And importantly, if you look at who is on the special interest working group within Bluetooth developing oracast you'll have, you'll notice a lot of familiar names because you will notice all of the major hearing technology companies on there. So this is a technology that has actually been developed where hearing aid users are actually some of the first adopters of this technology. That's where it's being adopted and innovated on the fastest. But the very good news is that it's not just for users of prescription hearing devices. This is a technology that will be available to lots of different people because all of the major earbuds and headphones from manufacturers, all the major mobile phone operating systems and mobile phone models over the next couple of years will start to be Auricast

compatible.

So when we're in a venue and we start to see signs saying AuraCast is enabled here, yes, people with hearing devices will be able to use that if they've got AuraCast compatible technology, but so will anybody else. So will anybody with any type of consumer earbuds that support AuraCast. And so this will be a sort of a great leveling of the ability to access broadcast audio where it isn't a legacy system that is only used by a very small proportion of, for example, patrons in a particular venue or of the foot traffic that comes through a venue. And therefore, if it isn't great quality, it doesn't get the attention that it deserves or nobody notices that it degrades over time. This is going to be something that can be accessed by anybody.

And so we're very excited about this technology giving access to not just people who've sought and got prescription hearing aid devices, but also over the counter devices and also just ordinary consumer technology. So let me sort of deep dive a little bit so you have a bit of an understanding of what AuraCast is and what underpins it. But a really important concept here is that oracast can be used for a whole number of different applications. And in fact the standards for ORACAST are still being developed. The working groups within Bluetooth are still working on, well, what features do we really need and how do we make this the most powerful technology we can for the users?

Examples of what's already been enabled in Orcast, in devices that are already out there in the real world are being able to broadcast an audio stream that anybody can pick up, so called public audio stream. So anybody with an ORACAST compatible device can see the stream exists and start accessing it. And you can do that, for example, from some models of mobile phones already. And manufacturers are producing ORACAST broadcasters that can just sit on the wall like just like a Wi-Fi access point. That's all they look like.

And can just start broadcasting audio streams. And importantly, and I'll give you one example here, we were very lucky to be in a very large music venue trying out different broadcast technologies. And whereas you might think of telecoil as being something where it's very dependent on where you sit in the venue, Aura Cast is one of those things where you put a box on the wall in one corner and pretty much your whole venue is covered, that whole room is covered. So it's going to be very easy for owners of venues and different types of public bodies, like public transport, for example, to start integrating this in because you don't need to tear up floors and ceilings and put in loop systems. You don't need to be very concerned about exactly where you place the broadcasters.

And you can reaccess them from almost anywhere. And they can broadcast music. They can broadcast mobile phones from a mobile phone, for example. You could use it in a concert if I need to broadcast announcements, for example. And you might have different announcements depending on where you are in the building.

Other features that have been introduced with Auracast is also the ability to password protect or time limit streams. So it can be used in, for example, sharing a private stream of music or a call with a friend or family where you only want certain people to access it. Or alternatively where it might be used in sensitive situations like in a doctor's office or in a bank, for example, where you want someone to be able to scan a code and access a stream, but then immediately and that code no longer works for anybody else trying to access it. So all of those things are already being worked into the standard. Now when you hear Auracast, one of the things you might see out there when you start looking at information about this is something called LC3.

So I just want to. And it's very germane to some of the research we did on understanding what Auracast does for audio quality. And so I just want to explain the relationship between these two. So Auracast itself is the broadcast technology and that is actually built upon a standard which is called

Bluetooth Low energy audio. And Bluetooth Low energy audio is a new way of using Bluetooth that as it says in the name, uses very little energy.

And one of the benefits of that is they can actually provide really good audio quality. Even when the signal strength and the interference is very low or the interference is very high. It can actually maintain excellent audio quality. And it does that by using something called LC3, which stands for low Complexity communications Codec. So these are all of the same, not the same thing, but they're all related technology.

So you might read about Bluetooth low energy audio, just be aware that one of the things that's been built on top of that is AuraCast as the broadcast technology. And you might read about LC3, which I'll talk a little bit more in detail now. And that's actually one of the key parts that makes it possible for them to use so little energy in Bluetooth low energy. So why would auracast bring sound quality improvements? And that's one of the questions that we looked at, because it's not just about all the convenience of AuraCast and broadcasting, but also that it can bring potentially much better experience for everyone.

So this is great for things like music venues. And this is data from Bluetooth themselves. So they've published data on the right. And so there's two colored bars. Blue is the new LC3 way of encoding audio, and gray is the one of the previous ways they use for classic Bluetooth that we're all used to, which is called sbc.

And what they're doing from left to right here is they're going from much more restricted signal bandwidth, so think less signal strength or more interference, all the way to the right hand side where you've got a really good strong signal. And what they see basically is they've tested how the quality of different audio, so higher on these bars is better quality. And what we see is that as the signal strength becomes weaker or the interference becomes greater, what you see is the quality of the blue bars. So

the new way of delivering audio pretty much stays the same, whereas the quality of the old way of using Bluetooth audio actually drops off very quickly. So old Bluetooth audio was not very tolerant basically in terms of sound quality, of degradation in the signal strength.

But with a new standard, they can actually use a lot weaker signals, a lot weaker transmission, save a lot of energy, it's much more protective against interference, but still deliver a really excellent sound quality. And that's magic when it comes to broadcasting because you don't want a system where as soon as you're slightly too far away, the quality just drops off very quickly. So this is an example of why it's a really good underpinning technology that then enables you to broadcast audio still at high quality, but over a big, big wide range. So this is really fantastic technology that underpins it. And Bluetooth themselves, this is their own data, have actually done some data on looking at the quality difference.

So there's many different parts to this graph. What this is is this is ratings of the quality from 0 to 100, higher being better of voice. So these are different samples of speech. And higher means better quality. And the gray bar here is the reference.

So this is basically the unprocessed speech. And people generally rated that as excellent. What you see across the different situations here are different ways of encoding audio for Bluetooth. And this is the classic Bluetooth here, SBC, and this is the LC3. And so what they saw is even at really good signal strengths, they saw actually the people preferred LC3, the new way of broadcasting audio, over SBC and better, much better over some of the other older technologies.

But when it came to music, this difference became even bigger. So just compare the LC3, the light blue bar, with the SPC, the dark blue bar. Again, this is the new versus the old technology, new technology being the light blue bar. And you can see that the quality ratings, it was good for SBC, but it was excellent for LC3. And so they've already sort of hinted that there is an improvement in sound quality with this.

But of course our interest is, well, what benefits does that bring, particularly to somebody with a hearing impairment? So why would it bring sound quality improvements? What is it about Orcast? Well, based on their data, we would hypothesize that actually Bluetooth low energy on Orcast would bring sound quality improvements compared to previous streaming technologies, particularly if they're based on those older audio encoding technologies. And we have to remember that for a lot of hearing aids, even things like TV streamers, for example, still rely on classic Bluetooth or even proprietary manufacturer streaming technology that rely on much older ways of encoding audio.

We thought that there would be significant benefits to sound quality even when tested under really ideal conditions compared to telecoil, because Bluetooth, low energy audio and oraCast are stereo versus mono, but also because there's a much greater extended bandwidth. So one of the things about telecoil that's easy to forget is that it's really excellent at speech because the bandwidth that it's very good at transmitting signals is really around those speech frequencies. But of course, when it comes to music quality, it's missing a lot of the extended bandwidth, very low and the very higher frequencies that really bring that quality and the fullness to music or the ability to differentiate between different instruments. So telecoil is a great experience when it's available and it's a clean signal. But there are significant benefits from a stereo signal and extended bandwidth from oracast.

And of course, in the real world we would expect even greater benefits compared to something like telecoil, because oracast we would expect to be a lot less subject to interference compared to telecoil, for example. Now, we did not simulate that in our research because it's not clear what an average level of interference is for a telecoil system. Some are very good, some are very bad. So we decided to test everything under the best conditions with as little interference as we could manage in our laboratories. So why is this relevant to people with hearing loss today?

Well, there's many reasons that I put on this slide. So first of all, the thing to say is that it is still an emerging technology, right? We've got limited transmitters for people to buy to put into venues. They're emerging really quickly. It's still limited use as a broadcast technology.

You know, people are still. We get contacted here at NAL almost every week by a different company or a different public body or a different venue going, hey, tell me about auricast, what should I be doing? So people are super interested in adopting it. They're very keen to adopt it, but we're still at those early stages. But most newer hearing aids now are coming with Bluetooth, low energy audio and Orcast built in, which is fantastic.

Which means as people are upgrading their hearing aids or taking up hearing aids for the first time, they'll already be Oracast enabled, which is really, really great. And because many of the sort of transmitters and the benefits of Orcast, you know, we haven't yet seen broad adoption, they're not yet widely accessible to clients, so it's hard to say we'll get an ORACAST enabled hearing aid because you'll be able to use it everywhere. Well, that's not quite the case yet, but it's coming. But the sound quality benefits can be experienced today. Why?

Because the new TV streamers, the new mobile phones are now coming with AuraCast technology. So they can already benefit, for example, from better streaming technology with a newer TV streamer or a newer mobile phone. So those personal use cases, they can already benefit. The use cases of getting better audio technology out there in music venues and so on will come in the future. So actually it's funny that we always think of hearing technologies lagging behind, but this is an instance where users of hearing devices are actually going to be the earliest adopters of this technology that will soon become commonplace for us all.

We'll walk into venues we'll see the Auricast sign, we'll know we can put on whatever headphones or buds we've got with us and we'll be able to connect hearing aids user like yeah, I've been doing that for

years. So they, they will be, and rightly so, the earliest adopters of this technology, which is really fantastic. And the technology, as I said, has been developed with them in mind from the beginning. So our question at NAL with all of these benefits of Auracast was really to focus on the sound quality benefits because we truly believe that the accessibility benefits are coming. And they're there because that's baked into the technology.

But we wanted to really understand will it really bring better sound quality? So we compare Bluetooth, low energy audio and Auracast to two key references. One is telecoil, because that's still to this day, even though it's a technology that was from the 1930s, is still to this day probably the mainstream broadcast audio technology for people of users of hearing devices. But we also compared it to some previous generation technologies, in particular an older TV streamer that used a proprietary 2.4 GHz streaming technology.

So what was our design? Our design was to stream different sound examples to hearing AIDS, either using AuraCast, using a proprietary 2.4 GHz streaming protocol. So think sort of older era, Bluetooth and telecom. We then recorded the outputs of the hearing aids on an acoustic mannequin so that we could get consistent recordings and a consistent experience in our laboratory and have exact comparisons of each of these. And then we presented those recordings to listeners to compare the overall sound quality via an online listening experiment using a very established sound quality methodology.

So just a little bit more on our stimuli recordings, we had our sound source. We then used different streaming technologies to stream the exact same sound source across the different technologies, which were then picked up by hearing aids which we then recorded and could play back. And it's really important to say we put a lot of effort into making sure that the perceived loudness of these different recordings, depending on the technology that was used, was the same, that we did everything we could

to maximize the quality of each one of these, including telecoil. We did a lot of effort to make sure that we had the best quality signal and the lowest interference as well. What do we stream?

We stream speech in quiet because that's a really important signal that we already know telecoil is very good at delivery. We broadcasted speech in noise. In this case, we used announcements of Speech at train stations as a very key thing that somebody might want to listen to. And then we also stream music because of that really sort of hypothesized benefits of stereo and extended boundaries. As I said previously, we went to a lot of bother to make sure these were all normalized to the same loudness level.

So there wasn't a difference between any of the stimuli or any of the different ways of broadcasting them. And we obviously also time aligned all of these different technologies so that actually a listener could switch between them. So let me show you what the methodology was like. So this is something called mushra. This is a standard way of comparing audio quality and it's called the method for the subjective assessment of intermediate audio quality, the quality level of audio systems.

And what happens is that the users have a play button where they can play the original stimulus not processed at all through hearing aids. They can hear the original quality and then they can press different play buttons to live switch between different ways of receiving it, from Bluetooth low energy audio, Aurora Cast to telecoil to the 2.4 GHz streaming for example. And one of those conditions was also the reference condition as well. So it was a hidden reference and they were blinded to which was which. And what they did was they heard a sound example, they could play it as many times they want, they could switch between them live as much as they wanted, and then they had to come up with a rating for each.

So let me show you the overall results. Then the overall results here are shown on a graph or higher up is better sound quality. What you see is we've got AuraCast, we've got Telecoil and 2.4 GHz. And what

you see is just as in some of the original data I showed you at the very beginning, AuraCast appears to be cutting out the best sound quality as perceived by listeners. So this is over all of the different sound examples.

So the highest ratings were For Auricast, the 2.4 GHz TV streamer were the poorest and Telecoil was somewhere in between. And when we did statistics on this, we found that OrcaCast was had the significantly statistically significant highest rating or quality. So the key message is overall different types of stimulus. OrcaCast seems to provide the best overall sound quality compared to other streaming technologies. But let's deep dive a little bit.

Let's go in to the different sound examples and here I'm showing you sound examples compared to AuraCast for music in red, voice in noise. So Speech in noise in green and speech in quiet in blue. And these are shown Both compared to AuraCast. So higher up the graph here means Auricast was better rated than the technology I'm showing. And you can see in both cases for telecoil in 2.4 GHz, the graphs, the bars go up the graph, they're above zero, which means that they were all rated as being a better quality with Auricast compared to these technologies.

So we see sound quality was better on average for all stimulus types with OrcaCast compared to the other two. And so we felt that the overall message when we did the statistic was that there was better sound quality for both speech and quiet noise and listening to music compared to other streaming technologies. And you'll see that there's some features of the technology where oracast was rated, for example, significantly better for speech and noise compared to the 2.4 GHz proprietary streaming technology, whereas telecoil did a lot better with voice. So the overall summary from our research is we think that hearing aid users could indeed experience better sound quality from using AuraCast and Bluetooth Low energy audio. We seem to see that it provides better sound quality compared to Telecoil even when tested under ideal conditions.

And also previous TV streaming technology that uses custom protocols from manufacturers. We think the hearing aids with Auricast can basically be the best of both worlds today. And what I mean by that is that actually you can get devices that have both Telco and Orcast built in. So where Telecoil is available, if they want, they can use that, or they can switch and use Bluetooth Low energy audio. They can access Orcasts broadcast in everyday situations.

They can Orcast enable streamer in their homes for their TV or their radio, and they can use a mobile phone that's Orcast enabled. Of course, for people who aren't used to using telecoil technologies and don't want to use that, their hearing aids will come pretty much these days almost across the board with Bluetooth Low Energy audio and Orcast from major manufacturers. And this is something that we expect to become pervasive. So this is really exciting. We think that it's really important to already start making people aware of AuraCast, particularly if they're getting devices that are Auricast enabled.

So when you're next prescribing devices or talking to people about hearing technologies, make sure you mention Oracast. And as I just finished by saying, this is not a technology that is just for hearing devices. This is a technology that is going to be available to everybody. So this is a fantastic thing that's really going to, we believe, drive take up of the technology across lots of different venues. And that's going to be fantastic because hopefully it will be widely available and supported into the future.

So with that, I'm going to hand over to my colleague, Bec Bennett. Bec over to you. Thanks, Parikh. Hi, everyone. I'm Bec Bennett.

I am a clinical and research audiologist, National Acoustics Laboratories with Parik and Taegan. And I am going to be discussing with you today navigating the digital frontier, barriers and facilitators to app use in audiology. What I would love if we can all find the chat function, because I'd like to ask a few questions and try and make this a little bit interactive if we can. So, Christy, if you could please open the webinar chat so that it's open to everyone and everyone on line. If you look down the bottom of your

bar, you'll see there's the chat icon down the bottom and I'd love you to please jump in the chat and tell me where you are.

So, National Acoustics Laboratory. We're based in Sydney, but I'm actually based up on the Sunshine coast in Queensland, Australia, and I travel to Sydney once a month to meet in person with my team. And up here on the Sunshine coast, it is a glorious 30 degrees Celsius day. The sun is shining, the ocean is calling the rainbow Lorikeets and the cockatoos are going crazy outside because we have a lot of morning dew with the rain we got last night. And I can see in the chat here we've got, oh wow, lots of people saying hello from New York, Salt Lake City, Las Vegas, California.

This is good. I've heard of all of these cities. Sacramento, Yucca Valley, San Francisco, Oklahoma. Lots of people online. So thank you.

Wonderful to see you all. Welcome, welcome. So today in this session, we are going to talk about apps. I'm going to tell you a little bit about barriers and facilitators to adopting apps from audiologists that I've interviewed, that we've surveyed, and also from the perspective of adults with hearing loss in that clinical audiology setting. We're also going to talk about some apps that are currently out there that are evidence based that you might consider adopting and using in your own practice.

And we'll talk about some strategies for how you might be able to integrate them into your work. So to start off with, I wanted to show you this figure called the innovation adoption curve. And essentially it shows that there are a small proportion of people who are innovators creating the change. And there's this sort of proportion of early adopters, people who, when they see something new, they think, I want to try it, I want to get into that. And then we kind of have the early and late majority of people who wait until it's out there and it's more well known, and they adopt it at some stage, which is most people.

And then we have the laggards, those people who are kind of resistant to change. Now, I'm happy to share an embarrassing story with you if you promise not to hold it against me, but I haven't always been an early adopter. And back in 2008, I was at a party with a group of friends and one of my mates had just come back from the US and he had this thing called an iPhone, which were not available in Australia yet. None of us had ever heard of it before. And so at this party, he shows us his iPhone that he's gotten, and he's telling us it's three times the price of a normal phone.

But it's amazing because it can do all these things. He says, you can take photos with it. And I said, what do I need that for? I've got a camera in my handbag. And he says, you can listen to music on it.

And what do I need that for? I've got an ipod in my handbag. He says, you can check in emails on it, do stuff on the Internet, like. But that's what I've got a laptop for. And I said to him, I don't know if this thing's going to take off.

Well, not surprisingly, I was wrong. And of course, we all have smartphones now and they have revolutionized the way we interact with the world. Not always in good ways, but often in good ways as well. And so that was a real pivotal moment for me where I thought, all right, instead of being someone who's cautious about new things and change, I'm going to be someone who's more curious about new things and new technology when it comes out. And so I made a conscious effort to kind of change the way I consider and take on new technology when it's presented in front of me.

I am not a digital native. Being a Generation X, what's that one in the middle? I'm the in between the boomers and the X. And so sometimes technology scares me a little bit. And so I've, yeah, made a conscious decision to get in there and try new things and kind of give it a go early on.

So I would like you to think about yourself and think about apps in the audiology space and where you might land on this adoption curve. Would you consider yourself an innovator or an early adopter or

more towards the majority group or a bit of a laggard? We saw around 2012, quite a lot of audiology apps started to hit the market. And of course in 2018 there was a lot more starting to come out. And then of course in 20, during the pandemic, we saw a lot more apps come out onto the market and a lot more clinicians starting to adopt apps.

And so I'd like you to think about and if you want to jump in the chat and let me know where you think you are on this adoption curve when it comes to apps in the audiology space. Are you an early adopter, laggard, somewhere in the majority? Oh, yeah, We've got some early, early majorities. Oh, Philip, an innovator. Excellent.

I'd love to know what you're working on. Great. We've got a nice mix of people there. Great to see so many people in that early space. Really keen to see how you think about some of the results we've found here today.

So if we take a step back for a second, think about what do we mean when we talk about audiology apps? Well, back in 2015, there was a study that showed that there was 200 apps on the app store relating to hearing health. And then in 2020 that number nearly doubled to 389. And I would anticipate that during COVID period and the aftermath that we might have seen that number close to double again. There were a lot of apps developed around hearing aid management and support during that Covid time.

And so this early paper started to classify the different apps that are out there. So we have apps that are audiology apps that are designed for education and information. We have audiology apps that are around hearing testing, apps that support the rehabilitation like hearing aid programming and training, apps that are around sound enhancement or enrichment. So where you might use your phone as the microphone and plug earpods into instead of hearing aids to amplify sound. And we also have app that form sort of assistive tools, things like alerts, and I'll show you one of those a bit later in the session.

Why do I care about apps in audiology? What's the benefit? Why should we all care about apps? Well, there's been not a lot, but Some emerging research is starting to now demonstrate that these apps can be really beneficial, both for our clients and from a clinical perspective. So some studies are starting to show that incorporating apps into your clinical practice are both time saving and cost effective.

There's a couple of studies starting to show that specific apps can really result in improved clinical outcomes, including tinnitus relief and including experiencing better hearing aid performance in noise. And there are also other client outcomes around improved quality of life and improved social connectedness. So there are lots of reasons why we should be thinking about using and recommending apps in our audiology practice.

So when we think about the why, it's always good to think about the why not pros and cons to everything. Some of the literature is suggesting that some of the barriers to using apps in audiology practice are compatibility issues. So not all apps are available on Apple and Android or old phones. Also, time required to learn new skills. So some clinicians are saying they just don't have time to learn about the apps or learn how to use these new app products or the time to teach their clients about the apps and how to use the apps.

And there's also some element around client frustration. So we all know those clients that struggle with using Bluetooth and reconnecting. We've all worked with clients who can't remember their Apple ID password. And so there can be some, some sort of frustration in overcoming some of those hurdles. But in general, there was very limited research out there on the barriers to app adoption and so we decided to do some research in this space.

I'm going to share one of our studies with you here today, but we also have two PhD students that are doing a three year program each specifically on developing apps that are user friendly for adults with

hearing loss. And the second is focusing specifically on implementation. So how can we make it easier for clinicians to know about, talk about, promote and support app use in the audiology setting? So in the next three years we'll have a lot more to share on this topic as well. But for now, we focused our research on audiology app use.

We used a questionnaire here in Australia looking at both adults with hearing loss as well as clinicians. We focused on digital literacy and exposure, explored barriers and facilitators to app recommendation and also app uptake.

So we had the two participant cohort groups, adults with hearing loss and clinicians, and I'm just going to focus on adults with hearing loss first and then we'll talk about the clinician data afterwards. So we had a really wonderful response Rate 769 Adults with hearing loss across Australia recruited through social media and multiple hearing clinics. So it was really diverse. Catchment we specifically focused on 40 to 75 year olds because we wanted to look at the working age and the young older adults because this was part of a broader research program that is underway at the moment. So I just want you to keep that in mind.

The data I'm about to show on adults with hearing loss is that working age and young older adult cohort and the average age of this group was 61 years.

So our first questions are around whether they own a smartphone. Not surprisingly, 98% did own a smartphone and 98% used it daily. When we asked about what kind of general apps they use, there was 78% used entertainment apps. Most of them used lifestyle management apps like banking and calendars, but only half were using health apps. Now, I say only half, but actually that means half of our clients that we're seeing in the clinic are already using health apps for other ailments.

And so they'll have the skills and the capability and the interest of perhaps using a hearing related health app. But there are half who probably don't have experience with health apps and so they may need a little bit more support. Now, when we looked at digital literacy, it was quite interesting because 2/3 self rated they had a high capability of downloading and using apps. Two thirds were highly confident in downloading and using apps, but only about 1/3 were interested in trying new apps. So there's this sort of high skill but unreasonable motivation.

And so we would need to make sure that when we're talking about apps with our clients that we're really talking about the benefit that they will receive. And we're working on that motivation required to get them to actually give it a go.

Now, this is a big busy table, so I'm going to talk you through it. But essentially we looked at the research literature on implementation and general barriers and facilitators to adopting digital health in the broader space. And so then we compiled a list of potential barriers and facilitators to why a adult with hearing loss may or may not adopt an audiology app if recommended to them by their clinician. And so there was a long list of potential barriers and facilitators. I don't have them all here, I've just selected a few.

But the main thing I wanted to highlight are these red ones. So the biggest barriers were cost. If the app required a costly subscription or costly downloads, then clients said they wouldn't be interested or the other two key barriers were around safety and privacy. They wanted reassurance that the apps were safe, that the data was stored here in Australia, that the data wouldn't be shared with any third parties, that they could trust the information within the app. And not surprisingly, around sound quality issues as well, they wanted to know that an app that they were recommended was going to be easy for them to hear and listen and understand and have good sound quality.

Some of them described how they'd had negative experiences with other apps that had really poor sound quality and they couldn't hear the videos or the things inside the app. So, really important thing for us to think about there now, interestingly, the biggest facilitator was that the health professional recommended the app to them. Now, for me, that suggests that us, as the hearing professional, we're the biggest facilitator, so we have the power to really connect our clients with the apps that are out there and to motivate them to give them a go. They want to know what we have to say. Now, we asked these individuals what sort of support they would like when downloading apps and nearly 2/3 said they would download it and use it themselves.

And so what that suggests is most of the adults with hearing loss within this age group aren't asking their audiologist to spend a whole lot of time and set them up and monitor them and support them and all that sort of thing. They just want to be told what apps are out there that could help them and then they're going to take it on themselves to download it and use it. So in a clinical sense, I would imagine that if there are a range of apps that you feel that would benefit clients, just having little handouts or flyers that kind of list and describe the apps that could be helpful, won't take a lot of your time, but could really help your clients. However, aside from that sort of 2/3, there was a third who needed a little bit more support, 20% who said that they would like their clinician not only to recommend it, but to help them set it up and then just leave them to it. And then There was another 20% who said that they would like their clinician to tell them about the app, set it up, but then provide that ongoing support, check in to see how they're going with the app and really embed that app into the clinical process and into that clinical flow.

So importantly, and I guess like everything we do, a patient centered care approach is what they're asking for here. Some people want app support in different ways. To others. So really important that we set up our clinical practice so that we can service our clients in the way they want to be supported with these products.

So that's the adults with hearing loss. Now let's talk about clinicians. So we had a pretty good response rate. 149 clinicians across the country. No surprises in the average age.

We have a lot more female audiologists than male audiologists here in Australia. So the proportions there are as expected. Importantly, we had a nice range of experience, so some baby aurd and some very experienced ords. And we had a mix of audiologists and audiometrists, which are the hearing aid dispensers here in Australia, as well as business owners and managers who are usually the financial decision makers as to whether there's a change in practice or apps are offered and those sorts of things. So we're really happy to see a nice mix here.

No surprises here. 100% of this professional group owned a smartphone and used it daily. Not a lot of surprises in that they self reported high ability and high confidence in using apps. But again, there was a lower interest or motivation to actually use apps themselves for their own private life. So two thirds were interested in trying new apps and about 1/3 were said that they generally weren't interested in trying new apps on their own products.

And so it makes me kind of wonder whether their own personal motivation and interest in apps might influence whether they offer, recommend and talk about apps with their client. It's really important that as clinicians, we take the opportunity to think about whether our own biases might be impacting the kinds of service that we offer our clients.

So we asked about what kinds of apps our audiologists were recommending to their clients. And I'd love on the chat if you guys could tell me a little bit about some of the apps that you guys are recommending, whether there are Tinnitus apps or whether there are hearing aid related apps or what kind of apps are the most common apps that you're recommending to your clients, or if there's any kind of apps that you've found recently that you think you'd love us all to know about. We'd love to hear what sort of apps you're finding have been really helpful and beneficial to your clients. So please jump on the

chat and we can take this opportunity to learn from each other and, and see what kind of apps are the most popular out there. Yeah.

Tinnitus. Hearing aid. Hearing aid. Tinnitus. Tinnitus.

Yeah. And this is what we saw in our research as well. So this table shows in rank order the most common apps that are recommended and used with clients. Not surprisingly, the hearing aid self management apps. So the apps for changing volume and that sort of thing were most often second to that.

We found the Tinnitus apps, which it was only 30 or around 36% of clinicians were offering these apps to clients. But you know, that would be on it when the clinician, when the client requires it, a little bit of the remote programming, hearing aids. But then when we got to the other types of apps, there was a huge plummet and hardly any clinicians were offering these other types of apps to their client. So we saw very little recommendation of speech to text apps or mental health apps, self assessment apps, speech training and amplification apps, which I think is a real missed opportunity. I can see here.

We've got, yeah, lots of Tinnitus, lots of the hearing aid manufacturer apps. Oh, I love this one. Videos on hearing aid care and usage. Yeah, there are some great apps out there for those sorts of things as well.

So we asked our clinicians what proportion of clients they're currently recommending apps to. And I'd love to know, for those of you in the chat, what proportion of clients are you recommending apps to?

We saw here that in our cohort, yeah, I love it. In our cohort we saw that around two thirds or under 2/3 of clinicians were recommending it to 75% or more of their clients. And around a third of clinicians were offering it to fewer than that. As you can see on the graph here, I'm loving in the chat that most people

here are putting over 75 or 100%. And the reason is if we are to take that patient centered care approach, it should be the client's choice whether they're going to use our apps or not.

I would say most clients could benefit from an app. And so by letting them know that apps are available and what apps could help them 100% of the time, then it's really taking that patient centered care approach and letting the client decide whether that app is right for them and whether they want to give it a go or not. I'm really loving seeing all these high numbers. 90%, 100%, the over 75% category. Well done, guys.

So as you saw in the previous slide, there was about a third of clinicians who said that they're not recommending apps to all of their clients. And so really, the clinicians, being a gatekeeper, they're making a judgment on who they recommend apps to and who they don't. And so we asked an open question around, well, how do you decide what makes you recommend apps to some clients and not others? And because it was open text, we got some, you know, short answer responses and some essays from people which was great to see. But it was really interesting because the common themes were around client age, which I'm sorry to say is ageism.

If the clinician just looks at the age of the client and says, I assume you won't be able to use an app, therefore I'm not even going to tell you about it. There was quite a few people who talked about the severity of hearing loss, which I found odd, but I wonder if they actually mean the opposite. And if people with more severe hearing loss, they're more likely to recommend apps too. But there wasn't a lot of detail on why people were using hearing loss severity as an indicator. Lifestyle, I guess kind of makes sense, but we don't always know our clients full lifestyle, only the tidbits they tell us.

But there was a lot of these reasons based on clinicians judgment or clinicians assumptions. The clinician assumes that the client lacks digital literacy or that the client isn't tech savvy. And so again I'd like you to really think about, and I urge all clinicians to think about their own biases. Are we assuming

that our clients won't be able to do this because of their age or because they don't? I don't see them using their mobile phone or they don't talk about other technology.

If we make assumptions, we may get it wr. And so like we saw in the chat, if we're telling 100% of our clients about what apps are available, we really are being patient centered and letting them make the decision on whether they want to follow through with those or not.

Okay, so we also asked about barriers and facilitators to the audiologists recommending apps. And I'm going to go through this slide, but I love in the chat if people could tell me a little bit about what are some of the barriers barriers they face or what are some of the facilitators? So what helps them talk about apps with their clients or what stops them talking about apps with all of their clients? So in this cohort we found that the biggest facilitators were around knowing what apps were out there and valuing the apps that were available and understanding how they were going to benefit their clients. But the barriers were around insufficient training and insufficient resources.

We also found that there were barriers around time constraints and limited awareness of what kind of apps are out there that might benefit their clients. And then there were barriers around clients technological proficiency. So some clinicians did talk about how they would recommend apps to their clients, but then when they tried to help their clients set it up, their clients really struggled with how to use the apps and how to get the most out of them. And I can see here in the chat we have, yeah, concerns if their client has cognitive impairment, then adding apps on top of hearing aids can be quite difficult. Depending on the client's phone, 100%.

If there's incompatibility, if the clients don't have smartphones that can, you know, access the apps that you're wanting to promote, then absolutely, that's a real barrier. And yeah, look, it's a really good point. Wanting to become, wanting to avoid becoming tech support for the patient's phone requirements. It's a really interesting one to think about and I urge you to have a look in your area. Here in Australia we

have, there's quite a few hearing loss support groups out there and some of them are now starting to run these technology training sessions that are sometimes about apps but also about general using the Internet and using the phone and Internet banking and other kind of support programs for seniors.

And so it would be great if you are going to, if you are wanting to talk about apps more with your older clients, it could be really useful to have a look in your local community and see if there are any hearing loss support groups or general seniors support groups that might run these sorts of programs so that you can offer the apps and the training opportunities side by side so that you don't have to become tech support for all of your clients. And of course, yes, if the client says no, definitely. So we'll always offer it, but we're never going to push it. If the clients are not interested in apps or not wanting to try these things, then that's their choice and we respect their decision.

Okay, so that was kind of the core research findings, but I thought I'd like to take this opportunity for the clinicians in the room to talk a little bit more about three of the core barriers that we found and how we can maybe think about them differently in our clinical practice. So the first one is around age biases. Now we did find quite a number of clinicians in our survey said that they would make an assumption and if the client was over a certain age they just wouldn't talk about apps or technology or Bluetooth or any of those sorts of accessories, excuse me, that they use age as an assumption on the client. And so I just wanted to share some data with you around digital device use in Australia and in the US We've seen here in Australia quite an increase. So we have now 70% of our up to 70 year olds are using digital devices and smartphones, 60% of our 70 to 80 year olds and 34% of our octogenarians.

We saw a huge increase in uptake during COVID And we're starting to see now that there's also a huge increase in the number of older adults who are using telehealth. So a recent survey found that 50% of people over 65 in Australia had used telehealth for a consultation, which was up from 30% since pre Covid. So we're starting to see a lot more experience being gained in using digital devices for health

access. Now there's some similar in the U.S. i found this study in the U.S.

that shows that you guys are seeing similar trends. So 61% of older adults over 65 own a smartphone in the U.S. 55% of them are using video conferencing technologies like FaceTime, and 36% of them are using telehealth. And these numbers are on the rise. So yes, not all of our clients that come into our audiology clinic at present are going to have the technology or the skills or the experience.

But more and more are starting to have the technology, the skills and the experience to engage with these products.

I also wanted to share some research from colleagues of mine at Curtin University and the Earth Science Institute. Cathy Sucher, Mel Ferguson did a study last year looking at digital literacy. So they took a survey that measures digital literacy and they applied it to adults with hearing loss and compared it to the general public. So what I wanted to show you here is the average score of digital. So let me say that the higher the number, the better the higher digital literacy they have and the lower is the less digital literacy.

And so the red dotted line here is the average score of adults with hearing loss. Whereas when they compared it to normative data for older adults of the same age, the mean was this lower level here. And what that shows us is that adults with hearing loss or the clients that we see in our clinics, as opposed to your average older adult, the clients we see in our clinic actually have a much higher digital literacy than the general population. And maybe that's because they've been using hearing aids for a while, or maybe it's because we attract people who are interested in technology into the clinic, because those who are not interested in technology would not be interested in hearing aids and so wouldn't come to our clinic in the first place. But essentially what I'm trying to say is those previous slides that talk about the digital literacy of the general population, the people in our clinic are actually even better than that.

They're at a higher level than that. So that hopefully urges us to be even more inclined to talk about digital technology with them. And also just to say that the range of these individuals was actually higher than one might think. So, yes, we had some people who were really highly digitally literate and some who had quite low scores. But as you can see, it's not that all of the high scoring individuals were the younger ones.

We actually had some older adults, some octogenarians, and One of our 90 year olds scored 100% on the survey. And so we really need to take that patient centered approach and see each client as an individual and meet them where they're at.

Okay, so the second thing I'd like to focus on is the language, just to emphasize that our words and tone matter. So, look, I'm guilty. When I'm in the clinic, there are certain things. I'll go into autopilot and I have my spiel. Every time I do real ear measure, I'll say to the client, okay, I'm now going to put this thin tube in the ear canal.

We're going to do this, blah, blah, blah. And I kind of go on autopilot and I'm not thinking about what I'm saying. Words just fall out. Because it's the same spiel I use with every client when I talk about how I'm going to do really measurement. And I'm sure we have it for lots of different aspects of our clinical consultations.

It's not necessarily a good thing, but our brain does it to save cognitive effort. And so, you know, our brain does it for a good reason. But I would urge you all, when you've got a moment, record your spiel and play it back to yourself. In fact, I do this with our audiology master's students that I lecture here in Australia and I get them to do their spiel to their peers and then I give them these like squeaky dog toys. And every time the spiel includes a complex word or a negative tone or some sort of biases or something that we really don't want in our spiel, then the others in the group squeak all the squeaky toys and alert them and it gets them to sort of stop and think of a different way to phrase or a different

way to say.

I think we get so used to our spiel that we sometimes fail to see what's in our spiel. And so I urge you all to take a moment, record your spiel when you talk about apps and technologies and accessories and all of those technical aspects of an appointment, and then play it back to yourself and have a little listen. Are you using a motivational tone, saying things like it's going to be great and here are the benefits and this is why you should really think about it, or are you using phrases like oh yeah. And there are also apps that can kind of help. We can talk about them later.

Are you using dismissive words and tone or really motivating positive tone? So I'd love you all as homework to do that little experiment with yourselves and see how you go.

So the third thing I'd like to address is awareness. One of the core barriers that clinicians in our study indicated was that they just didn't know what apps were out there, which apps were good, which apps were evidence based, which apps they should be recommending to their clients. So feel free to screenshot. I've got two pages here that sort of categorize different apps that are out there and have some suggestions for the apps that we've looked at that I've used that I think are quite good that can help address some of these issues. So talking about health and education, there's a lot of great information and educational apps out there and I urge you all to scroll back up through the chat and have a look at some of the other apps that your colleagues recommended.

There are a couple of apps that I'd not heard of there, so I'll be adding them. I'll be checking them out and adding them to this list as well. There are some great hearing self assessment apps which can be really nice for clients to monitor their hearing loss, especially those with fluctuating losses. All the manufacturers these days have great apps to support hearing aid use as well as remote programming. So if you're not using them regularly, call out your local manufacturer and I'm sure they'd love to come to your clinic and talk to you about those.

There are some really great tinnitus management apps out there and some great captioning apps as well. Here's the second slide, talking about some speech training apps that are available, sound amplification apps, alert and safety apps, environmental sound level meter apps, as well as some great Mental health and wellbeing apps.

So I'm going to talk a little bit about a couple of the apps here. I know in the US you have the H is it LAA Hearing Loss America association, you've got a client advocacy group in the US and we have about four or five of them here in Australia. And one of them, the Deafness Forum, created this app app called Happy Hearing, which is a great educational resource that talks about what hearing aids are, how to use them, how to clean them, how to look after them. And so it can be a really neat app to provide to your clients alongside the hearing aid manufacturers app that also has some of this information because sometimes people learn in different ways. Sometimes they want to hear a story, a video from a real adult with hearing loss using a real hearing aid.

Or sometimes the way one app might describe a phenomenon might be confusing. And so having it described in another way can be helpful. So the more resources we can provide people, the more likelihood they can find information in a way that helps them understand the content.

The nowscribe is an app developed by my colleague Nikki Chong White at National Acoustics Laboratory, and it's a live speech captioning tool that can be used in real time. So, like you all hopefully have put your captioning on and you're using your captioning in this presentation, this can be used for live captioning. Now, quite a lot of clinicians here in Australia are using nowscribe for a number of different ways. We've got some that have it set up on an iPad. And so they'll have at the clinic waiting room, the admin will have live captioning when they're having conversations so that they're not having to raise their voice and kind of to the rest of the waiting room isn't hearing the louder conversation over the desk.

They can have use a fairly comfortable voice and have live captioning supporting people who need that extra support at the front desk and also in the clinic. Some audiologists are using it in the clinic for similar reasons. Also, you know, sometimes you'll take the hearing aids out to do a hearing test or to set up the REM or whatever you really measure, whatever you're doing. And so having that live captioning when you remove the hearing aids can really help some clients not feel so anxious that they're not going to miss what the audiologist is saying when their hearing aids are out. So it can be a real helpful tool for those situations and of course not just for clinicians, but it's a Wonderful tool for the clients as well.

Now we've received some beautiful, beautiful emails from clients talking about how this tool has really helped them in numerous ways. One of the most common ways I see people using nailscribe is in the car. You know, when you're driving, hopefully the driver is facing, looking at the road and not looking at the other people in the car. And so in that car environment we lose that face to face communication. And that can make it of course really difficult for people with hearing loss.

And so having that live captioning scrolling on their phone while they're having a conversation in the car can really help them to keep up with the conversation, whether they're in the front seat or the back seat. Of course, also that same scenario whether you're on bus or train and those sort of group environments. And we also see a lot of people take it to their social gatherings when they're playing bridge or mahjong, you know, those sorts of things where they want to hear their table, but not so much the other conversations at other tables. It can be a great one to pick up that sort of close environment. So some really great applications, really worth recommending it to your clients.

There's a new Tinnitus app been developed by some people here in Australia and although Fabrice is now based in London, but Mind Ear, so you may have heard of tinybot, which was the early Tinnitus relief app, but they've added in, they further developed the product and added in some more additional

features and rebranded as Mind Ear. The reason I like Mind Ear as an app is because it really is science backed. There's some randomized control trials that show its efficacy as a cognitive behavioral therapy tool. And they've also put a lot of effort into making it sort of user friendly. And so it's got that great client engagement.

So if you're looking for some additional Tinnitus apps to recommend to your clients, I suggest having a look at Mind Ear.

There's another app that's somewhat recently been developed called the Ambient Menu. This might be a little bit Australia centric, but hopefully you'll be able to find something similar in the US or hopefully it'll make its way to the US eventually. But essentially it's like a, oh, what are those, what are those products where when you go and stay in a hotel and you rate how good it was. So other people anyway like that kind of thing. But essentially adults with hearing loss can go into a restaurant and when they're in the restaurant they can measure how noisy the environment is they can rate how easy it was to hear and those sorts of things.

And so when they're looking for a restaurant, they can find the restaurants that are highly rated or poorly rated on sound acoustics. And so it can be a really useful thing for people who are looking for a restaurant that's easier to hear, but also especially for people who are in those early stages of getting used to hearing aids. The last thing we want is a brand new hearing aid wearer to go to a noisy restaurant and be overwhelmed with all the sound. And so it can be a really good tool in those early hearing aid use experiences, but especially also for people with more severe hearing loss that really struggle in those noisy environments.

And also for those people with more severe hearing loss. It can be really helpful to let them know about these tools, such as the Brachy app, which is like an alert app. So they can link the app to their sort of doorbell or phone or intercom. And so when one of those devices around the house goes off, if they're

not hearing it, the phone will vibrate. And so they'll have a physical alert to the sound that are around them that they may be missing.

So it can be really wonderful to give people that peace of mind that they've got. You know, they're not hearing those things, they've got that, that vibration, that tactile alert as well. And there are a few different apps out there that do this, but Bracky was one of the better ones that I looked at recently. I thought, anyway, moving into mental wellbeing, which is a passion of mine, as many of you may know. There are quite a few great mental health and wellbeing apps out there.

One of them that I really like and I use myself is called Smiling Mind and it's a meditation app, but it can really help reduce stress, anxiety, depression and improve relationships. This one was developed by researchers here in Australia and there are. There's quite a bit of research to support its benefits. There's been randomized control trials, all sorts of things. It was developed by psychologists and it has a real broad base.

It's not just pure meditation. It talks about how to use meditation and breathing and calming to build mental fitness and resilience, to improve your sleep, to improve your study, reduce stress and all those sorts of things. So it can be a really great holistic app for all things. And then another one is called Headgear by the Black Dog Institute. I'm not sure if you've heard of them.

They've recently released an app that is probably more geared to a younger group and it's about a 30 day mental health fitness challenge. So if you're feeling down, how to kind of jump in headfirst into an intense program to really help you build emotional, emotional resilience and emotional wellbeing.

So just looking. Okay, I've got. Oh, thank you. HLAA is the group in the US and also. Thanks, Philip.

There's a group, there's an app in the US called Soundprint which is similar to that ambient menu in the States to help people find restaurants. So please jump, jump on the app store and have a look at that one. That's wonderful. So in summary, I just wanted to say digital health apps in audiology are growing. There's a lot of benefits to be gained by using audiology apps.

Benefits to the client, to your clients, but also benefits to yourself in time saving in the clinic. We've talked a lot today about some of those barriers to adoption and hopefully reflecting on some of those barriers, you might be able to see how you can address those and increase the kinds of apps and the frequency of app recommendation to your clients. I just want to emphasize that clinicians, you guys play a key role in facilitating the adoption of these products and so you have the power. And also just to say, future success in audiology will likely rely on leveraging these digital solutions. So depending on where you are on the innovation adoption curve, if you're down around this end and maybe take a stop and have a think and see if you want to bring yourself and join me up at this end over here.

So the ball is in your court. I want to say a huge thank you to all the participants in all of the studies, to all of my collaborators, and to you guys for your attention so far this morning or this evening where you are. And I would like to hand over to my colleague Tegan Young, who's going to talk to you about goal setting. Thanks, Tegan. Thanks, Bec.

Hi everyone. As Bec said, I'm Tegan Young and I'm a research audiologist here at nal. The topic that I will be presenting is Insights from the use of the Client Oriented Scale of Improvement, or the cosi. I want to start with a caveat that in Australia we call the people who come into a clinic to see an audiologist clients, as you can tell by my title rather than patient. So I've tried to change my wording, but if I slip up and say client, you know who I mean.

If you have any questions for me during this presentation, please Add them to the Q and A chat below.

So in this session you will orient yourself or reorient yourself with the concept of clinical goal setting in audiology and the COSI. You'll hear about the research that my team and I have been conducting on the COSI. As part of the broader hearing needs discussion, you'll be introduced to the new NOW Goal Setting framework and you will learn how you can enhance your clinical practice by incorporating elements of the NOW Goal Setting framework into your hearing needs discussions with your patients. For those of you who are completing the exam for CEU points, this section of the presentation comes under Learning Outcome three to be able to describe the new NOW Goal Setting Framework and how it can be used to enhance goal setting discussions in clinical practice. The exam questions covered are numbers five and six.

Okay, so I want to set the scene a bit. You are visiting the audiology clinic for the first time. The clinician has completed the hearing assessment and explained the results and is now starting to say that you need hearing aids. You are just processing this information when she starts to ask you some really odd questions. What do you do in a usual week?

Why does she need to know that? Do you go to any regular meetings? That's a bit personal. What sort of TV shows do you like to watch? Who do you watch with?

How far away from the TV do you sit? Is she inviting herself over for movie night? Now put yourself in the shoes of the clinician. Looking at your notes. The patient really isn't giving you any information that you can turn into a smart goal.

Looking at the time, you still need to choose the hearing aids. So you decide to jot down a few of the scenarios that they mentioned in the case history and you'll review them later.

And this is what might get recorded. The patient has said something about wanting to hear the TV better and the clinician records to be able to follow the dialogue on the TV when he is watching the

news with his wife at his wife's preferred TV volume. If you are someone who regularly does goal setting with your patients, this may sound very familiar. Sometimes the goal setting goes really well and other times it really doesn't. If you are someone who hasn't tried goal setting with your patients or have tried in the past but have given up, stick with me and I hope that I can help you to get your goal setting discussions back on track.

So what's the problem with goal setting? We know that goal setting is a core part of person centred care. However, the tools that are available in audiology, such as the original COSI are limited, making it hard to steer the conversation in the short time available. Clinicians want to follow best practices but feel it is too difficult. The follow on effect is that patients are not involved in the process and are left unaware that goals have been set for them, nor do they have any idea of how to attempt or achieve those goals, slowing their progress and resulting in unnecessary additional appointments.

The most commonly used goal setting tool in audiology is the original NAL Client Oriented Scale of Improvement or cosi. In countries where goal setting is required for claiming or funding, COSI is often the goal setting tool of choice. As you can see, it is a basic form where the clinician writes down the the patient's goals, usually two or three situations that the patient reports having hearing difficulty in. The clinician then reviews them at a later appointment, measuring the patient's progress against their degree of change in that situation and their final ability in that situation. Apart from digitisation, there has been no major updates to the COSI since it was developed by Harvey Dillon and colleagues in the late 90s.

To give you an idea of how the COSI is commonly implemented, as we have observed in Australian clinics generally, the clinician will begin the goal discussion at the assessment appointment after the hearing results have been discussed and devices have been chosen. Often the clinician is leading this discussion and asking questions that the patient may not realise are meant to lead them towards goal

setting. Patients are not routinely given a copy of the goals to take home, nor are the goals reviewed at the fitting, meaning there could be a six to eight week delay between setting and reviewing goals without any reminders. At the follow up appointment the goals are reviewed with the clinician selecting an arbitrary score for their patient's degree of change and final ability. There is no prescribed process or guidelines to discuss the purpose of goal setting nor to steer the goal discussion.

So what happens if goal setting isn't done well? As I mentioned earlier, goal setting is part of person centred care along with building rapport and discussing your patient's hearing needs. Clinicians report that it is sometimes difficult to discuss goals with their patients. I've added a direct quote from one of the clinicians that we interviewed here. Sometimes it is like pulling teeth to get a clear goal and some of you may agree with that sentiment.

Observations of clinical appointments have shown that the audiologist tends to take the lead in these discussions, as Bec talked about before, dominating the conversation and using complex language and specific jargon that the patient may not realise they're meant to ask what that all means there is a lack of shared decision making and the patient is not often presented with a range of options.

And how does this affect our patients? Studies have found that a lack of person centred care in the hearing needs discussion can lead to unrealistic expectations, poor hearing device uptake and usage and even patient dissatisfaction. Are we really listening to our clients?

Because of this, NAL has been reviewing the use of the COSI as part of the broader hearing needs discussion. We wanted to know how the COSI is implemented in clinics and what happens during the goal setting. Discussion could the COSI be improved to make it easier to use and add value for patients and clinicians?

We looked at a lot of data to build our understanding of goal setting and the use of the COSI clinically. We were given access to retrospective data of over 1 million goals from a nationwide hearing service provider in Australia. We conducted one on one interviews with clinicians, we observed appointments in real clinics around Australia and we conducted a survey of audiologists from all over the world. We also reviewed the goal setting literature from audiology as well as other health disciplines and also training materials from universities and internship programs to see how people are being told how or taught how to do the COSI or goal setting with their patients. In the time that I have today, I'm going to give you the highlights of this work so I'll start with the clinician survey.

This survey was disseminated via social media networks and groups, via Facebook and LinkedIn and all other kinds of social media. We wanted to know if clinicians did goal setting with their patients and how they felt about the goal setting. Discussion what worked and what didn't work? The survey was answered by 98 clinicians from 16 different countries. The countries that were represented included countries where clinical goal setting is the norm, such as New Zealand and the UK, and also countries where goal setting in audiology isn't common, like the USA and Hong Kong.

The respondents of the survey were generally in favour of clinical goal setting with 84% reporting that they did do goal setting with at least 80% of their patients. We were hoping to find out if clinicians used any other tools to set goals with their patients, but all of the goal setters reported that they do COSI that they chose COSI as their goal setting tool.

Some respondents reported that they combined the COSI with other measures in order to help them complete the goal setting process. Some used hearing difficulty questionnaires such as the HHI survey or the self Assessment of Communication to help them link goals to the patient's hearing needs and some mentioned using discussion tools rooted in patient centered care such as those offered by the IDA Institute.

When asked why they do goal setting, the most common reasons clinicians chose were to adhere to patient centred care or evidence based practice principles followed by complying with regulations and to measure outcomes or satisfaction.

We also asked clinicians to name the key challenges to setting goals with their patients. All identified at least one major pain point in setting goals with their patients that is not addressed by the existing goal setting solutions. The most common challenges that were that patients don't were the most common challenges were that patients don't know what goals to set nor do they want to discuss goals followed by cognitive issues and a lack of clinical time.

We also conducted one on one interviews with clinicians from around Australia, including really experienced clinicians and people who are still doing their internship, as well as rural and remote areas as well as urban. So we were trying to get a really good mix of people who would use the cosi. As I mentioned before, in Australia everybody who is claiming government hearing aids does have to use the cosi. So we were pretty sure that the people we were interviewing did goal setting and were familiar with goal setting and part of the idea for the interviews was to gain a deeper understanding about the goal setting discussion as part of the clinical appointment. And I'm going to go a bit deeper into these insights over the next few slides.

So from the interviews we could see that like in the survey, clinicians do think the goal setting is important and that they prefer to use the cosi, with one clinician noting that I think it is a good way to have a checklist to make sure that the patient is receiving benefits. So it's often used as a bit of an outcome measure to make sure that your intervention is doing the right thing or to decide if your patient needs more help before you sign off that they are ready to go with their hearing aids. Despite all this support for the cosi, clinicians also told us that it can sometimes be difficult to negotiate goals with their patients, saying sometimes it goes really, really well and sometimes it's like pulling teeth to get a clear

goal, which you might recognise from the quote earlier. They also reported that the current COSI procedure is overly flexible and that they aren't sure they're completing it correctly, saying I don't really feel like there's anything hard or fast, like there's no rule to it. I feel it's just whatever the patient needs and everybody's got their own style of doing what they're doing.

When we asked them about how they chose the goals with their patients, the clinicians reported that they prioritised what the patient wants over what is actually achievable with hearing devices, with one clinician saying, I'd always list it because we don't know what devices are going to do and what might be achievable one day. It's reasonable to have goals that we won't achieve and just to let them know that we're listening. Conversely, they all discussed worrying about giving their patients unrealistic expectations, even though they chose the goals that were often unrealistic.

We also asked clinicians about how they structure the goals. Discussion they reported that they don't routinely give patients a copy of the goal, nor do they have time to discuss the goals at the fitting appointment leading to that six to eight week delay between first discussing the goals and then reviewing them that I mentioned before. When asked if giving a copy of the goals would be reasonable, one clinician said, yeah, I could give a copy, but it needs to be easy. We're time poor and I think a lot of us can relate to that. That clinical appointment is that clinical appointment time is so precious.

Hold on. Okay, I'm going to the final section of the data that I'm going to be discussing is the retrospective analysis of clinical data that we got from a large Australian hearing service provider and we analyze this data using large language modeling and AI. There was over 1 million individual goals representing nearly 400,000 patients and more than 1200 clinicians. So it was a lot of data.

We found that the average life of a goal was about 628 days from creation to the last time it was updated, and that clients had an average of 3.25 goals per cosy discussion, which is what we were expecting. We also found that only 27% of goals of cozy goal records included advice on how to

achieve them or information on strategies and tactics. But interestingly, goals were more likely to be achieved if strategies weren't recorded. There was also a mismatch between common hearing needs questionnaires and the most common listening goal topics, suggesting that the surveys that we're doing or pre assessment questionnaires may not actually be getting to the most important hearing needs of our patients.

Analysis of the COSI data showed that only 8% of COSI goals were ever marked as achieved. More than 90% of the goals were left marked as in progress, which was also the default options, suggesting that they may never get changed. Of the COSY goals still marked as in progress More than half of them had a final ability score suggesting that the patient was successfully able to participate in that activity or perform that task either almost always or most of the time, leading us to infer that clinicians did not like the finality of marking goals as achieved.

We also saw that certain goal topics were more likely to be improved by the follow up appointment than others. These goal topics include hearing the tv, having hearing aids that are comfortable to wear or don't cause feedback, hearing in quiet, hearing in noisy situations, hearing at home or one on one, hearing in groups, hearing without asking for repeats, hearing on the phone and being able to hear silence or not to notice their tinnitus. As you can see, these topics, with a couple of exceptions, tend to be either the less complicated goal topics or the activities that people do most often so have the most opportunities to attempt with their hearing aids between the fitting appointment and the follow up appointment, like hearing on the phone, hearing their family at home, and hearing the tv, suggesting that picking more frequent activities could aid in goal achievement. Rather than picking activities that the client feels most attached to, you might want to steer them towards things that are most likely to be achieved rather than to be able to hear at Thanksgiving in January.

By synthesising all of this data, we started to see issues with the current COSI goal setting process. We saw that the patient is often not involved in the goal setting discussion, particularly when there are communication barriers. The patient is not told why it is important to set goals and what their role in the goal setting is, or even that goals are being set. This results in goals being unattempted and unachieved. Clinicians reported many barriers to setting goals with their patients, including lack of clinical time, difficulty identifying relevant goals based on the patient's hearing needs, and difficulty setting goals that are attemptable or achievable, particularly by the next appointment.

In the short term, these issues are exacerbated by communication barriers such as cognitive issues and language barriers.

So how could what we learned from the data enhance the goal setting process? When we looked at the barriers to discussing goals and listened to the feedback from clinicians, we could see that an ideal goal setting discussion would have a more structured process. It would link to the client's hearing needs, be rooted in patient centered care, be quick and easy to administer, and would support their clients in setting and achieving their goals.

So what did we do with all that data?

Well, we incorporated these key insights with our review of the goal setting literature and have developed an enhanced goal setting framework which we have been calling the six Active, Aware, agree, attempt, assess and Achieve the framework is built around the client being an active participant in the goal setting process. They know that it's happening and they are part of it. They are aware of their goals, they know the purpose of the goal setting process and they know when progress will be reviewed. They agree to work towards their goals with the guidance and support of their clinician. They know how to attempt their goals with smaller tasks that are achievable in the short term.

They are able to track and assess their progress between clinic visits and finally they are able to achieve their goals and celebrate their progress with their clinician.

So to remind you of how the COSI is commonly used, goals are usually discussed and set at the assessment appointment and then usually reviewed at the follow up appointment. So how does this fit with the proposed goal setting framework?

So at the moment this is how goal setting looks and how it fits with the framework. So as I mentioned before, currently the patient is often a passive participant. The purpose of goal setting and their role in it is not clearly explained. The patient is not always aware goals have been made nor are they given a copy of the goals to take home. Patients are not asked to commit to attempt their goals or achieve their goals.

Strategies are rarely documented as part of a management plan and the patient is not told that they need to attempt their goals before the follow up appointment. The patient does not know the goals will be assessed nor how they will be assessed. And finally, goals are left in progress indefinitely so achievement is not shared or celebrated.

So how could the goal setting process look using the NOW goal setting framework? If we look at active if the patient is an active participant in the goal setting discussion, they know why goals are being set and when they will be reviewed. Aware the clinician explains the goal setting process and the patient knows what their goals are and they are given a copy of the goals to have at home or that you could email them as well. It doesn't have to be a paper copy. When we think about agree the patient and the clinician agree on the goal and discuss when they will be reviewed.

Attempt the patient is given smaller tasks and strategies to help them attempt their goals. They commit to attempt these goals by the follow up appointment. Assess the patient knows when their progress with

their goals will be assessed and how to assess them so that they're ready to make a self assessment to support the discussion with their clinician and finally achieve. The patient's goals are marked as achieved when appropriate and this achievement is celebrated. New goals are agreed upon and updated strategies are provided we believe that by implementing elements of the NOW Goal setting framework, patients and clinicians will be able to have better discussions about their hearing needs.

Needs that will set them up to attempt and achieve their hearing goals and then go on to set more challenging long term goals for the future.

Elements of the NOW Goal Setting framework are currently being tested with clinicians and patients to inform updated tools and procedures that will enhance the use of goal setting in audiological practice. The eventual aim is to release an updated COSI tool which is we are calling COSI 2.0 and a new procedure that is more in line with rehabilitation goal setting, best practice and patient centered care which is coming soon.

While you wait for COSI 2.0 to be released, what small changes can you make to enhance goal setting in the clinic? These are just some ideas that I've had, but maybe you could add your own ideas. In the session chat. You could provide your patient with information about why goal setting is important. You could send out a hearing needs assessment or goal worksheet before the appointment to save clinical time.

You could print out the goals for your patient so that they have a copy to take home and refer to. You could mention the goals again at the fitting appointment so that the patient is reminded of what they are aiming for. You could include strategies in your goals so that your patients know how to attempt and achieve their goals and you can celebrate the achievement to show your patients that you support them.

Thank you so much for listening and I want to thank the NOW COSI research team, Poric, Jess and Meg. If you have any questions about this work on COSI or goal setting, please add them to the Q and A below or get in contact with me at my email. Thank you.

Okay, we'll move into questions.

Thank you so much. We have here a question in the queue. This was from earlier on in the presentation. I believe. This would be for you.

Dr. Kitter. The comment goes Aurocast broadcast are not affected by electromagnetic interference as much as telecoil systems because of the stronger signal or is it because the transmitter will be closer? Could you clarify? Yeah, really great question.

Actually it's for none of those reasons. It's true that it's less susceptible to electromagnetic interference, but the reason is because it's a digital technology rather than an analog technology. So if you think about how telecoil works, it's effectively taking the audio and sort of modulating the strength of this electromagnetic field up and down and then that's get picked up. But that change in the magnetic field induces a current in the user's coil in their hearing aid. So any change in the magnetic field necessarily gets resulted in a difference in the signal that ends up being interpreted by the hearing aid.

With AuraCast technology, essentially it's digital technology. So while it's sending that technology using radio waves, it's digital. So it has lots of things like error correction in it. So one of the reasons it's not susceptible interference is because even if there are other signals around that might interfere with the radio waves that are being broadcast, those interferences can be detected by the device receiving it, the hearing aid in this case. So when it decodes the audio signal, it can actually decode it in an error free way.

So first of all it's sending the signal in a different way, which means that when the device decodes or interprets the audio signal, it can correct for errors. The second is that because it's a digital signal, they can send lots of redundancy and there's also processing that is between the steps of sending it, receiving it and interpreting it. Whereas with telecoil, whatever gets sent by modulating the magnetic field just gets received and then typically just sent directly to the user as audio. So it's very, very susceptible. The proximity of the transmitter is actually, it's sort of the opposite with oracast.

When we've tested it in really large venues, we can have the oracast transmitter in one corner and you know, small box on the wall like a WI fi access point and we can pick it up using hearing aids on, you know, the very far corner, sort of, you know, you're talking over 100 meters away at least more so I know how many feet that is, my apologies. But a long way. So actually the thing with forecast is with the commercial transmitters you can be a very long way away. And because the signals are being sent digitally and decoded digitally with error correction, it's just less susceptible to interference.

Thank you, Dr. Kenrick. Here is another question from Gregory. Gregory asks when will COSI 2.0 become available and how would one go about obtaining. Thanks for that question, Gregory.

We are currently testing the Cusi 2.0 prototype. It's a digital tool and we're hoping that it will be really useful and really applicable in a lot of clinical scenarios, whether it's over the counter or in person or as a self directed module. But yeah, it is currently under testing. So I can't really be very clear about when it will be available. But if it's something you're interested in working with us on or helping test out.

When we have a clinically ready prototype, please get in touch. We're very keen to have as many real life clinical situations test the tool before we release it.

Margaret asks, is there a cost to using the Nalskra? No, no, it's free. Nowscribe was developed with adults with hearing loss. For adults with hearing loss and it's freely available for download and use and

sharing with everyone. Yeah.

How does Auracast provide better sound quality compared to other broadcast and previous streaming technologies? Technologies? This is in relation to exam question number two, Dr. Kitterick. Yeah, absolutely.

So it provides better sound quality both because it can transmit without being affected by interference. It's got stereo, so it's able to broadcast in stereo. There is a way to have broadcast broadcasts in mono if you don't need stereo, but it can broadcast in stereo, can also broadcast with very extended bandwidth, very low to very high frequencies, far beyond the bandwidth of typical telecoil systems, for example. So there are many, many different ways in which the, in which AuraCast really provides significant benefits. But the key things are more immunity to interference, stereo, greater band bandwidth and of course, as we've shown in our own data, the way that it encodes audio and sends audio, it's very good at producing quality even when the signal strength is very low.

And that's one of the reasons why you can be so far away from an audio an ORACAST transmitter and still get good audio quality.

Thank you for clarifying. Dr. Kinn Kim asked is there a limit to how many devices one can attach to oracast? Yeah, again an excellent question. No, it's the simple answer because think of it more like.

So I'm sure there is some sort of theoretical limit, but the reality is that the ORACAST broadcast devices are just picking up a broadcasted signal. So other than when you have things like security and encryption enabled on a, on a broadcasted stream, for example, where you have to negotiate with the transmitter to check if you're allowed to connect, it really is just about devices receiving the stream. So a lot of the commercial devices that I've seen, when I've talked to manufacturers of devices that are designed to be wall mounted and broadcast and I say, hey, how many devices can connect to this?

They say we don't actually know, but it's more devices than we could ever imagine trying to connect to it. So for all intents and purposes it's pretty much unlimited.

There may be some oracast broadcasters that might struggle if a large number of Devices are trying to negotiate that they've got the right password to connect to a stream, but if it's a public, public broadcast stream, you don't have a password. And it's just pumping the audio out there pretty much unlimited devices can pick up the stream and just listen to it.

Thank you, Dr. Kitterick. Gregory asks if he wants to do a trial with COSI 2.0 in the clinic and collaborate on that. Who would they contact to set that up? Yes, you can send me an email, Gregory, or anyone else who's keen to trial the COSI 2.0.

So my email address is Taegan.youngal.gov.au or you can find our contact information on our website as well.

We have another question in the queue here for the group. What venues do you predict that will support AuraCast in the near future? Will it be airports or public transport theaters? Yeah, thank you for asking that question. It's a great question.

I can sort of answer this in a couple of ways. You know, one is to think about who might use it. But the way I prefer to answer this is to say who's been calling us, knocking down our door, saying, hey, what should we be doing about OrcaCast? How do we use it? How do we deploy it?

And I can tell you who those kinds of venues are. So the kind of venues who we've seen a great take up are music venues, particularly concert halls asking, hey, how does this work? Is this better than telecoil? Should we make this available to our patrons? What are the benefits?

What are the advantages? And we're actually actively working with some concert halls on trying to figure out how to do that really, really well. Other we have public buildings, think libraries or other public access spaces going, hey, what is this thing? Should we be doing this? Is this an appropriate technology for people with hearing devices?

And our answer is always yes. And for everybody else who accesses your venue, so definitely get on and start using it and we can help. Another example is public transport systems. So we get contacted both by public transport systems themselves, so the authority themselves, but also the companies that make things for public transport systems asking us about auracast. So that's an example of sort of how much interest there already is.

And we try to do a lot of public dissemination around AURCAST because we want to get people excited, we want to promote this open universal standard for broadcast so that hopefully lots of places learn about it and ask these questions and then want to deploy it. When I think about the who should really be accessing oracast and deploying oracast. The key things for me is any place where anybody, but particularly those with hearing loss and those who use hearing devices might benefit the most from a direct audio stream. So the key things that come to mind are any public transport, anywhere where there are announcements being made. So airports is a great example, example of that.

Train stations, famously echoic places where although the technology has got very sophisticated over the years, it's a lot less echoey and boomy when they make the announcements than they used to be. It's still a very, very hard environment to listen in. When we talk to concert halls, we don't just talk about using them in the concert hall themselves because they can get a really excellent stereo extended bandwidth signal. And if they do it really well, you know, really think about what signal they're sending to those users and give them a really great experience. But you can also use it, for example, in front of house announcements.

We'd also love to see it in places like hearing clinics or anywhere else where we know that people with hearing impairment tend to go. One of my greatest frustrations is going to larger hearing clinics where they can be quite noisy, particularly if they're inside of the buildings. And it's very difficult for people to even hear when their name is being called, for example. So that's a great example of where an orcast broadcast might be. Fantastic.

Doctors clinics, another place where on hospital reception areas or waiting rooms where people tend to call out names, you know, to say that somebody's necessary next. That's an exact environment where ideally you would be using AuraCast. I've already talked a little bit about concert venues, which is again another great application for this. But finally, I don't want to forget this as well. I'd like to see it, you know, in and really promote the adoption.

Any place where there's anything sort of public sort of broadcasting or lecturing going on. So think universities. Fantastic for universities. They can have, you know, very old buildings and very large amphitheaters or theaters or lecture theaters, but still provide really good quality. And guess what?

It doesn't just have to be hearing aid users can be. Anybody with a compatible device could tune in and hear the audio better. And it's so low latency, you don't really need to worry about hearing the direct sound and the sound through your earbuds. It's quite impressive. And then one of the other places you know is also things like in public building, like Parliament buildings, or in, you know, anywhere where people can go and watch government Doing business, you know, state government houses, you know, here in Australia, parliaments, places where people should be able to access what's going on, any public lectures, things like that.

So those are the kinds of venues that I think are really, really excellent. But the beauty about oracast is it's not just a modern equivalent of telecoil. And that's one of the things that I really want to emphasize. I think if people only use it where they would have used telecoil, then that's a real shame because I think

the technology allows you to use it in so many different ways. Even the fact that you can have a password protected or a one time password to access a sensitive audio stream, it can be encrypted so nobody else can listen.

You can think of all of these use cases. Banks could use it when they're talking to their customers and have a secure link. So only the person with hearing loss or with the device can hear what's being said, for example. So there's lots of different use cases. So all of the places you would think telecoil, but also there's a lot of other places.

Now when you think of this as a way for anybody who would prefer to get a direct access to sound directly to their ears through their hearing devices, no matter if they've got a prescription to device or not, you can use Auracast. But of course the big ones are things like concert halls, places where announcements are made and places where there's any sort of public broadcast. I hope that's helpful.

Thank you. Dr. Kinrick, the last two questions in the queue here before we close the classroom, are there any security risks with Auracast like there is with Bluetooth? Yeah, that's a really great question. One of the things that the Bluetooth special interest group that's been developing Auracast is keenly aware of are these use cases that require very, very high sensitivity.

So as I've just said, think about talking in a bank, talking to a doctor for example. So they're building into the standard the ability to have very highly encrypted secure audio streams. And there's many different ways that people could access those. A password is one example, a one time code so somebody can scan a QR code, but as soon as they join the stream using that QR code, nobody else can join and it's encrypted. So for example, a doctor could be using this.

So every patient, if they want to, could join, you know, their stream to talk to them and hear them directly. In a busy place. But once a patient joins, nobody else can join until the doctor generates a new

code and that generates a new conversation that somebody else can join. So, yes, the security is sort of being thought of from the ground up with this. You can of course have open public broadcasts as part of oracast.

That's one of its features. But it doesn't have to be that it can be highly secure. So yeah, it's built in and thought about from the very beginning.

Thank you, Dr. Carrick. I believe this question is also for you as it corresponds to oracast. This is the last question here will take. Kim asks, is ORACAST relocatable?

Can it be moved to a different meeting or space? Yeah. Again, another great question. Yes, it can. So Auracast transmitters can come in many forms.

So just like Bluetooth, you have a transmitter and you have a receiver. So typically when we think of transmitter, we think of our phone or a laptop or an iPad and we think of a receiver as a Bluetooth speaker or our headphones. So with auricast we've still got a transmitter, we've got a receiver. Now some transmitters will be designed to be fixed so they'll be on a wall like in a music venue or something like that, A little white box or something like that. But other transmitters are incredibly portable.

So some modern phones and this will become increasingly available. They can be Orcast broadcasters as well. So you can literally bring that around with you. There are other auricast broadcasters that are already on the market. So there are examples from order.

There are examples from GN for example, and other companies. So not to be exclusive to anyone manufacturer here, where they're already producing little pieces of technology that are no bigger than a mobile phone, in many cases they're much smaller that can take any audio input. Think of just plugging in an audio source like a typical audio cable and can just broadcast that and you might power it off

either a battery bank or any sort of USB C power supply, like a laptop power supply or any sort of phone charger. So those are already eminently portable and you can bring them around. And that's actually one of the things that we would really encourage you to do with your patients is don't just think about how current broadcasters might be sold.

For example, there are ORACAST enabled broadcasters that are being sold as TV streamers. But just because they call them a TV streamer doesn't mean it's a very small Oracast broadcaster transmitter. You could plug that into your car stereo and Power it off a USB port in the car or a battery bank. Bingo. You've got an AURCAST broadcaster in your car.

You could move that into a meeting room and plug it into the output of a computer or a laptop so that it can broadcast directly to you you during a meeting, for example. Or you could use it at home attached to the tv or you could move it into the garden, to the radio, wherever you want. So that's another thing is to look at if something is abroad, an ORACAST enabled broadcaster you can use it anywhere for and connect it to any audio source. So don't just think of it as a TV streamer. So yeah, there are very portable ones and there are ones that will look more like a typical WI fi access point on a wall and everywhere are in between and they'll be built into our mobile phones with new models into the future as well.

Thank you all for your question. Well, I'd like to, you know, hand the mic over to Dr. Bennett and Dr. Young if they wanted to leave any closing comments as well as Dr. Kitterig.

We'll go ahead and go around the horn.

Thanks, Christy. I just wanted to pick up on a comment in the chat. Margaret said that she has staff in her clinic that help provide tech support for patients and that's a huge facilitator. And I just wanted to say I think that's a great idea. If you have key personnel in the clinic who have the skills and the time

and the interest in being that tech support, whether it's for future Oracast questions or also app related questions.

And the future Cosi 2.0 will be did you digital product? So there might be some support for that product as well then? Yeah, really thinking about how you can redesign your practice sort of structure and your practice patient flow to make sure that the clients who need it are getting the support that they need, is a great idea. So thanks for that comment, Margaret. And that's it from me.

Thanks. Yeah, and from me, I just want to thank everyone for your attention. I think we've had some really great comments and really great interactions via the Q and A. And look, if anyone is keen to hear more about the work we're doing at now, not just these three areas but all of our work, we've got some amazing colleagues, all very busy with lots of different things. You can either check out our website where we regularly post updates or about projects that have finished, or via LinkedIn and other social media, we.

We put out music now really regularly which just comments on things we've recently done and also sometimes asks for people all around the world to help us out. We're really good at Australian audiology, but we're always really keen to make connections everywhere. So please connect with us on social media and through our website. Yeah, and thanks, Teg. I was just going to echo the same thing.

It's an absolute pleasure for us to have the opportunity to talk to you about the work that we've been doing and the kinds of topics that we're very passionate about. I hope today's been really useful, but don't let the interaction end here. You know, we're out there on social media. You can contact us on our website. We're always interested in hearing what the challenges are at the clinical coal face, what problems you're facing and whether there's research that we're doing or have done in the past that can be helpful to you in how advancing your practice.

So thank you very much. Thank you all. Eric, could you please advance the last slide? This is just to remind the participants if they choose to earn credit for today's presentation. Just hope that you enjoyed this presentation and join us again next year.

Thank you, everyone.