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Hearing Technology and Research PATient Centered Care

Presenter: Maddie Olson, AuD

You.

Hello everyone. Thank you for joining us today. My name is Maddie Olson. I'm the manager of Clinical Product research here at Starkey and what my team does is work on product validation. So we look at products before they go to the market to make sure that they'll meet your patients needs from a performance benefit and safety perspective.

But today I'm here to tell you a little bit about person centered care and the role of advancements in hearing and how that might influence what person centered care looks like moving forward. So let's dive in.

Okay, so we have a couple frequently asked questions here. The first how do I ask a question? So you'll want to go to the Q and A for that. So if you go to the bar at the top of the screen and then go to the More tab, you should see an option called Q and A. There you can type your question and send it to me.

And we should have some time for questions at the end. There's also a handout that corresponds to this presentation. So there's a PDF handout that can be accessed through your pending courses on Audiology Online or you can click the link in the chat. Within this classroom, this course is also eligible to earn CEUs. Those are available with a paid Audiology Online membership.

After completing the course, you'd go to your pending courses on Audiology Online and then you'd have to pass the multiple choice examination. If you need assistance, you can always call Audiology Online or there's an email there as well. You could also use the Q and A window to contact our Audiology Online support who's live with us on this call. As well, there are some potential risks and benefits associated with taking courses, so those are just listed here. You can also access these online too.

And then here are today's learning outcomes. So first we'll describe the impacts of hearing health on overall health. We'll describe the role of hearing healthcare providers and using hearing technology to aid in overall health and wellness goals. And then finally we'll identify how hearing healthcare providers can incorporate methods that assess aspects of a patient's health while also treating their hearing loss. So really looking at the whole person.

So with that we'll dive into our overview. So this course will look at an introduction to comorbidities and person centered care. And we'll kind of chunk those comorbidities into themes. So the first being psychosocial and psychological, the second being balance and falls, and the third being cognition. We'll go through some key takeaways and then we may have some time for a Q and A at the end.

Okay. So as we know, the World Health Organization reports that more than 1.5 billion people worldwide experience hearing loss. And here in the US it's approximated that 15% of US adults have self reported hearing difficulty. And this is just self reported. So it doesn't necessarily mean that 15% of US adults have come to see you in your clinic, but they've self reported that they believe they have some difficulty hearing.

And with hearing loss, there can be lots of conditions that may co occur with the hearing loss. So things like psychosocial health, and maybe that's anxiety or depression, mobility restriction, cognitive impairment, diabetes, cardiovascular disease, arthritis, cancer, stroke or vision impairment. And because these things can co occur with hearing loss, it's important for us to understand the impact it might have when treating our patients with hearing loss. So one pretty obvious example on the slide would be something like arthritis. So we know when someone comes into our clinic with arthritis that we might go, especially these days with the new battery laws, with a rechargeable product rather than a zinc air product, because rechargeable will be a little bit easier to handle.

There's fewer small parts. So we'll go through other examples like that throughout this presentation with some less obvious comorbidities with hearing loss.

And here's a couple examples of those comorbidities. So things like diabetes can co occur with hearing loss. And what does that mean? It means that patients who have diabetes are actually twice as likely to have hearing loss compared to their age matched peers. And why would that be so there's a couple reasons.

Diabetes can result in high blood sugar or low blood sugar. With high blood sugar, the high blood sugar can actually damage the blood vessels and nerves in the cochlea and this can lead to hearing loss. On the other hand, if you have low blood sugar, this can damage the ascending neural pathway from the inner ear to the brain, and that can additionally cause hearing loss. A couple other considerations with diabetes. We know when we're performing cerumen removal with this population that we have to really be extra cautious to make sure that we don't cause an abrasion in the ear canal, because that could be slower to heal than someone without diabetes.

And something interesting I learned while prepping for this presentation, those with diabetes also have a higher PH of their cerumen, which can actually make it more likely to develop an infection like otitis externa. So just really being cautious when we're removing cerumen in patients with diabetes. So as not to cause infection or abrasion. This also means, though, that we need to be sure that we're educating other healthcare providers of those who treat patients with diabetes that a hearing screening may be recommended just to be sure that if they do have hearing loss, which they're twice as likely to have, that they come in to see us for hearing screening and receive intervention, if appropriate. The second example would be something like cardiovascular disease.

And here it's actually the underlying risk factors of cardiovascular disease that makes someone more at risk for hearing loss and cardiovascular disease. So that would be things like diabetes, smoking, high

blood pressure and high cholesterol. So these are all associated with an increased incidence of hearing loss. And why I think this example is important to point out, many of these risk factors are potentially modifiable or controllable. So with diabetes, we want to be sure that our patients are taking good caution to make sure that their blood glucose is under control.

If they're open to it, we could recommend a smoking cessation program, making sure that their high blood pressure is well under control with medication and diet, and same for high cholesterol. Because as we know, with hearing loss, prevention is key because once we start to develop hearing loss, it's very unlikely that it will reverse, especially with most sensorineural hearing losses. So understanding that this could put you at a greater risk for hearing loss also means that we should be sure that we're recommending to our person centered care team that anyone presenting with these risk factors also be recommended for a hearing screening to make sure that if they do have a hearing loss, we can intervene sooner rather than later.

So for today, we'll be focusing on three comorbidities, like I mentioned before, so psychosocial health, mobility restriction, and cognitive impairment. And we'll be thinking about those comorbidities from the perspective of person centered care. And I think most of us likely know what person centered care is, but let's go through a couple definitions. So from the patient perspective, this means that patients are making informed decisions about their care and their well being and that they have a team of providers who know them, listen to them, and are accountable for their care. From a provider perspective, this means that healthcare providers work collaboratively with patients and other healthcare providers as a team to do what's best for the patient's health and wellbeing, and also providing healthcare providers with the big picture information so we can make better decisions for our patients care.

And before we dive into what this looks like in audiology, which can be a little abstract. We wanted to go through a really concrete example. So this is Tyler. And Tyler met with his doctor about breathing problems and was then diagnosed with asthma. So in addition to prescribing Taylor or Tyler a rescue inhaler to treat his symptoms, the doctor didn't stop there.

He also followed up with a telehealth visit to identify some contributing factors and assess his current living conditions. And given that, they came up with a comprehensive plan that considers Tyler's health, behavioral and social needs. So instead of just giving him a rescue inhaler, the doctor also recommended a smoking cessation program, of course, when Tyler's ready to quit. And then also wanted to leverage some community partners and public services that could help him understand what in his living situation might be contributing to his asthma and potentially exacerbating it. So this is a good example of not just treating the asthma or the hearing loss like we'll talk about, but also what else might be affecting the person's quality of life due to their asthma.

So with that, we'll kick off our first module. So we'll be talking about psychosocial and psychological factors and how they relate to how we treat our patients with hearing loss.

So we'll go through lots of studies today. We really are looking to the literature for much of the information we're finding today. So this first study comes from Laird and colleagues from 2020, and they did a qualitative study on comorbid psychological symptoms for older adults with hearing loss. So those psychological symptoms were anxiety, depression or psychosis. And they spent a lot of time with those participants conducting interviews, trying to understand from the patient or participant's perspective what the impact was of those psychological symptoms in conjunction with their hearing loss.

And they came up with three themes, the first being that there's a cumulative impact of the hearing loss and the psychological symptoms. So here they described a two way additive relationship between the

two symptoms. An example here, the participant recognized that previous social anxiety may be in part due to hearing loss. So if they know that they're not hearing as well in a group context, that might exacerbate or contribute to their social anxiety for fear of a communication breakdown happening in those social situations. The second theme was the experience of loss through hearing loss and through audiological rehabilitation.

So here an example would be something like frustration with the ability to have hearing restored to normal with hearing aids, because as we know, there really isn't a way currently for us to restore normal hearing with hearing aids. So this really begs the question of how we should be counseling our patients too, to be sure that they know that that's not a realistic expectation when going into those hearing aid fittings. So they know what to expect and can potentially then expect and mitigate some of that frustration. Some of the other losses they described were kind of things like missing the comedy of conversation or just kind of missing out on things that they're not aware of when they're having communication breakdowns. And then the third was a little bit more positive.

So the experience of gain through hearing loss and audiological rehab. So some of these gains were gaining access to conversation, gaining confidence in social environments, and some improved friendships were reported too. So this can all lead to intervention improving the quality of their life, increasing their social interaction, and improving their social bonds.

So given that we know that hearing loss and comorbid psychological symptoms can relate to one another, the authors then speculated that therefore, audiologists should provide rehabilitation that addresses not only the hearing loss, but also the impact of the hearing loss on the emotional, physical and social aspects of that person's life. So, like bringing it back to our example earlier, we wouldn't want to just stop at treating the hearing loss with hearing aids, but also diving a bit more into that patient's life to learn a little bit more about the emotional, physical, or social aspects their hearing loss may have had

on their quality of life.

The next article we'll be looking at was from Holman and colleagues from 2022, and they set out to determine the hearing related emotions and whether there was any themes across those who had hearing loss. So this was a qualitative study and they used interviews to answer the following three questions. What hearing related emotions are experienced by adults with hearing loss and how do they occur? What impact does hearing aid use have on those emotions? And to what extent does the experience of hearing related emotions vary among adults with hearing loss?

Like, are there themes here or is it quite individualized?

And one of their first findings was these scatter plots. So on the left we have the daily life emotions related to hearing loss and on the right the daily life emotions related to hearing aids. And for these plots we have valence on the x axis and arousal on the y axis. So arousal is kind of how triggering the emotion is and valence is the relative pleasantness or unpleasantness of the emotion. So what we notice right off the bat is with those with hearing loss or the emotions related to hearing loss, everyone here has hearing loss.

The emotions are largely more unpleasant and can be a little bit higher on the arousal scale. So things like Stressed, angry, scared, or embarrassed. We also see acceptance related to hearing loss, and of course that's a positive emotion. And then if we flip to the right side of the screen, the emotions related to hearing aids show quite a different trend. So we see that emotions are largely more pleasant and are a little bit less triggering or arousing as well.

So things like joy, happy, confident, relaxed. We do still see some unpleasant emotions in the hearing aid plot. So things like annoyed, embarrassed, discomfort, and some of those are actually feelings that can be introduced by hearing aids too. So maybe some self consciousness of having to wear hearing

aids all the time, or frustration with the sound quality. But I think the main takeaway for me from this slide is that with hearing aids, we know from the research and from doing lots of interviews that the emotions surrounding your hearing loss become more pleasant when we introduce hearing aids and are a little bit less triggering as well.

And the patients who were part of this study noticed that trend as well for them as an individual. So I think this really just tells me that it's important for us to gather some of this information in our counseling before we fit the hearing aids. And we can say based on the literature that we can expect that some of these negative emotions go away when we introduce hearing aids. But we can't over promise we know that there will still be some frustration or maybe embarrassment of wearing hearing aids that lingers when we introduce those hearing aids. But it's largely a very much net positive when we introduce those hearing aids and the impact it has on emotion.

The authors also broke it down into some themes of emotions. So we'll go through those next. The first was a theme of identity and self image. So the emotions related to this were things like loneliness or embarrassment. The authors noted too, that some of these feelings may actually lead to a behavioral change where the patient might actually then have a smaller social circle because of those feelings.

They also describe things like difficulties at work and how that can cause frustration or anger, and finally acceptance. And this could be acceptance of hearing aids or acceptance of their hearing loss in general. The second theme of autonomy and control, looked at coping strategies and how the patients that were interviewed who have hearing loss really prefer environments where they can use good coping strategies. And they know about those strategies because you've probably told them about them too. So making sure that they're sitting in a good position in a restaurant, if they're going to a lecture, trying to get a seat close to the front so they can hear a bit better, potentially sitting close enough that they could hand the speaker an accessory if they have one, so they can hear the communication

partner better.

And someone in the sample had even said that if you're deaf, you're never late to meetings. And what I took away from that was that if you're late to the meeting, then you're not able to have as much control of the environment to pick the good seat next to the speaker, to position yourself so that you're facing everyone, your back isn't turned to anyone at the table. So really those activities where you have a high degree of choice and control were generally preferred by this sample of hearing aid users. The third bucket was personality and dominant emotional states. So the authors noted that those who preferred things just right tended to have more negative emotions surrounding their hearing loss.

And they didn't really do any personality assessment here. So this is just based on what they learned about these patients in the time they were interviewing together, but they really didn't do any formal assessment of personality. They just noted that those who wanted things to be just right had more negative emotions. And then on the flip side, they noticed that kind of self reported introverts reported fewer negative impacts of their hearing loss. And that just might be due to the type of activity that the introverts were selecting for their social gatherings.

So maybe smaller social gatherings or quiet social gatherings where the impact of their hearing loss may not be as dominant. And then finally, this cost benefit analysis we really did see on the prior slide too, where hearing aids allowed more positive emotions and reduced negative emotions, and that there were some negative emotions that were created by the hearing aids, especially if there's frustration with expectations not being met or if the sound quality isn't what they'd prefer. So there can be things that are introduced by the hearing aids, but it's largely net positive.

So here at Starkey, we have an ongoing study with 29 hearing aid users and this actually wrapped up last week. So hopefully we'll have more data soon. These 29 hearing aid users completed the following outcome measures. So from a diagnostics perspective, they did an audiogram and the quicksand. For

psychosocial, we looked at UCLA Loneliness Social Network Index and the Mini Markers Big five, and you'll hear more about those in some upcoming literature reviews too.

The MOCA or the Montreal Cognitive Assessment was done on all participants. And then from a hearing perspective, we looked at the AFAB and the RHHI to get a look at their overall health. We did a survey called the SF36. And then what we have on the right side of the screen is a correlation matrix. So here we're looking at all those outcome measures and seeing whether they interact with one another.

So if there is an interaction that's significant, that's designated by a bolded number within the square. If you see a number that's not bolded, that just means that it did not persist after we accounted for the fact that we had multiple comparisons. So we'll just look at the bolded numbers here. So some of these make sense too, and are just pretty intuitive. Like the pure tone average for the right and left ears is correlated with the 0.88 value in the upper left.

And that makes sense because these users largely had symmetrical hearing loss.

But what we wanted to know was we wanted to look at whether the personality assessment that we did had any relation on loneliness or social network size. Because as we learned from Holman and colleagues earlier, they noted that in their sample, for those who preferred things to be just right, they tended to have more negative emotions surrounding their hearing loss. And the authors also noted that if you had more negative emotions surrounding your hearing loss, you might ultimately make a behavior change to have a smaller social circle. So we were curious if we'd see any correlation among our group of hearing aid users. So on the mini markers, Big five, you might have heard about this.

If you've taken any psych classes in undergrad, it's looking at five different personality traits. One of them is neuroticism. So those who are neurotic tend to have more negative emotion and just kind of

fixate on things a little bit more. And here we did see that those who were rated high on neuroticism as measured on the mini markers, Big 5 also had a correlation with how much self reported loneliness was measured too. And this was a moderate to high correlation.

And of course, this is just correlation. We can't say anything here about causation. So next we'll dive into some literature about loneliness.

So this is a study out of Japan where they looked at a large database. They had over 1100 participants in the database. And these participants had a hearing test, were 60 plus years old, and did not own hearing aids. So looking at that group because they had a hearing test, the authors could then determine if they belonged in the no hearing impairment group or the hearing impairment group. And then they used something called a convoy model to determine social network size.

So the convoy model is visualized on the right side of the screen where you're in the center, and then there's those concentric circles surrounding you to picture relative closeness to you. So in the innermost circle would be people like spouses or best friends. Then relatives or friends are one circle out from there. And then on the outermost circle would be relationships like co workers, doctors or neighbors. So then the authors looked between those who had hearing impairment and those who did not.

And here if they had hearing impairment, it was untreated hearing loss because no one in the sample owned hearing aids. And then they looked for differences between the groups. They noted that there was no difference in the number of non kin included in the inner and middle circles, but the number of non kin included in the outer circle was significantly less for those who had untreated hearing loss. And I think that might make some sense because those in the outermost circle are a little bit less familiar to you. You don't have that relationship where you can repair as easily.

If you have a communication breakdown, there might be a little bit more embarrassment since you're just not as familiar with those people in your circle. So we noticed that the or they noticed that the outermost circle had fewer non kin relationships in the outermost circle, which is least familiar to you? And then finally, the total number of combined non kin in all three circles was significantly less for those who had untreated hearing loss compared to those who did not have hearing impairment. So there's a big caveat here in that this is just for those who have untreated hearing loss. We don't know anything from this study as to what would happen if you introduced hearing aids, but this does seem to tell us that if you have untreated hearing loss, there can be consequences on your social network size.

This next study is from the Achieve study. So this is not the most commonly cited outcome of the Achieve study, but really lends itself to our conversation today. So we thought we'd focus on it. If you're not familiar. The Achieve study is a randomized controlled trial here in the US They've got several sites throughout the country and they had 977 older adults with untreated hearing loss and without dementia in this subset of the population.

And the outcome measures probably look a little familiar. Starkey felt a little inspired here. So they did. The UCLA Loneliness Scale, the Social Network Index, Audiogram, Quicksin, and the Hearing Handicap Inventory for the Elderly, the screening version. In just looking at the sample in general, the authors noted that the prevalence of loneliness was 38%.

And they noticed that among age matched peers, based on the literature, it's generally closer to 29%. So just given that these individuals had untreated hearing loss, they had more self reported loneliness than their age matched peers. And for every 10dB increase in pure tone average, the prevalence ratio of moderate or greater loneliness increases by 19%. So greater self reported loneliness with greater degrees of hearing loss, better quicksand performance was associated with greater social network size, diversity and score, which I think makes some sense. If you're performing better in those complicated

environments, it might have less of an impact on your social network.

And finally, they noted that there was worse hearing related quality of life and that was due measured by the HHIE and that this was associated with a 29% greater prevalence of loneliness and a smaller social network size. So if you have self reported quality of life concerns as measured by the hhi, that might also lead to greater loneliness.

And this study is actually kind of fun, at least I think it is. So this was out of Canada and the authors went to several different clinics throughout Canada and, and surveyed patients that visited the clinic. So this population is already looking at people who have taken the first step to at least choose to visit a clinic. And at that point, that's when they got enrolled in this study. And as part of the study they interviewed the patients and got some information about their social network composition, social support and loneliness.

And then they followed them for three to 15 months to see whether they ended up purchasing hearing aids. And their question was ultimately, do stigma, social network composition, social support and loneliness matter when considering who purchases hearing aids? So what they found was that age was a significant predictor and that each year accounts for a 5% increased likelihood to purchase. And I think this makes some sense. We've known in audiology for a while that it takes individuals with hearing loss a while between when they notice that they have hearing loss to when they ultimately do something about it.

The stats are always changing, but I think it's somewhere around seven years. So in those seven years, age is obviously progressing too. So this one doesn't surprise me too much. Just based on what we know in audiology, greater adoption was seen with greater disability and with poorer thresholds, which I think again makes some sense. If you're struggling more, you might be more likely to ultimately purchase the hearing aids.

The one that really is interesting to me is that if you have contacts who have hearing loss or if you don't know someone who had a negative experience with hearing aids, this was associated with purchasing hearing aids. So this makes me wonder, is there something that we could do in our practice to get our patients better connected with those who have hearing loss? In the community. And if they're connected through your practice, you'd hope too, that the people that you're referring to, one another, have had a positive experience with hearing aids too, so that they can hopefully influence each other to ultimately make the good decision to purchase the hearing aids to get the help that they need. So maybe there's something we could do here.

Could it be things like recommending HLAA meetings in the area, or even doing group therapy following hearing aid purchase? Or maybe for patients who are on the fence when they first come to visit the clinic, could we recommend that before they decide to purchase hearing aids? So, something to think about there. I thought that was an interesting finding that we as a field might be able to do something about. Interestingly, there was no significance of stigma or loneliness in determining whether someone purchased hearing aids, at least in this sample.

And let's remember that this sample 2 is already a group of individuals who decided to make the first step to visit the hearing clinic. Though they might not be ready to purchase hearing aids, they were at least ready to go visit a hearing clinic. So maybe some bias in the sample itself.

All right, this next study is looking at how do audiologists address psychosocial needs? So this study used concept mapping to categorize different methods that audiologists who are currently addressing psychosocial needs use in their daily practice. So they came up with seven themes, and some of these will probably seem pretty familiar to you because they're things that you're including in your practice, maybe without even knowing that this is what you're doing is addressing psychosocial needs needs. But it was things like including communication partners throughout the hearing rehabilitation process.

So encouraging a partner to join your appointment to also learn about their partner's hearing loss and potential communication strategies that they could use at home and in daily life.

Promoting client responsibility is a big one as well. So self advocacy and self management were part of this method as well. Personalization of the program, also facilitating peer or other professional support. So we kind of talked about this on the prior slide. This would be things like encouraging clients to connect with other individuals who have hearing loss to build that support system, or things like improving social engagement with technology.

And I know we're all doing this, so we're fitting hearing technology and strategizing on how to use that technology to improve engagement. This might mean things like recommendation of accessories too. So depending on their lifestyle, would an accessory like a table mic or remote microphone help them to better engage in those complicated listening environments? Providing social support was mentioned as was client empowerment. So these were just some methods that audiologists have been using.

And next we'll look into how it whether patients feel like this is beneficial.

So they did a follow up study with the same group a year later and they interviewed both audiologists and patients. They reviewed those seven psychosocial management strategies and asked the both groups the perceived benefit and the likelihood to use those strategies. And in general, the perceived benefit in likelihood to use ratings were rated positively by both the audiologist and patient groups. In general, the authors noted that the internal approaches were favored over the external approaches. So what do we mean by that?

Internal approaches were things that you as the audiologist and the patient could kind of tackle together. So let's see, it was things like promoting client responsibility, providing emotional support and client empowerment versus the external approaches where things where others would have to get

involved. So maybe inviting a communication partner into the appointment or doing some of those peer support groups. So it is interesting to know that from a patient and provider perspective, those two strategies aren't necessarily favored over the ones that could be handled more one on one.

I'm just going to grab a drink of water.

Interestingly, providing emotional support was rated highly by both groups. So I think that's worth noting because I do think as audiologists we are doing a fair bit of this, whether we even know it or not in our appointments. And it's good to know that that is perceived as beneficial and that people are already pretty likely to be doing this already, which means that they're comfortable doing it already. But does that mean that we could be more intentional about how we're providing that emotional support in our appointments? Could we intentionally leave five minutes in the appointment maybe towards the end to really just check in with our patients, hold some space and make sure that any emotions that they're feeling can come up within that five minute period so that we can talk about them and potentially have recommendations that we could make to address some of those emotional needs.

All right, and then we'll talk about scope of practice. We've talked a lot about different psychosocial and psychological comorbidities with hearing loss. What do the clinical best practice guidelines say about our involvement in that type of work? So I think ADA summarizes this best, so we'll focus on that one. But I also have AAA and ASHA on the screen as well.

So from an ADA perspective, the audiologist provides counseling regarding the effects of hearing loss on communication and psychosocial status in personal, social and vocational arenas. So they're giving us permission to be participating in counseling. AAA also says things like we should be doing this as part of a treatment plan and working with other healthcare professionals too. And that really lends itself to the theme of TIP Day, which is person centered care and really working on a team with our other healthcare providers.

All right, and that brings us to our second module, balance and falls.

So why balance and falls? How are they related? So we know that individuals with hearing loss have an three times increased risk of falling compared to age matched peers. So that's a really big staggering stat and something we should be paying attention to. And we also know that the severity of hearing loss has been found to correlate with increased fall risk.

So for every 10dB increase in hearing loss, the odds of falling increase by 1.4 fold of an individual falling in the preceding 12 months. So greater risk if you have hearing loss compared to no hearing loss, and greater risk as your hearing loss progresses and becomes more severe. Additionally, a study looking at physical function in adults with hearing loss found that any degree of hearing loss was associated with decreased physical function compared to normal hearing peers and that over time individuals with hearing loss had a faster physical decline when compared to their normal hearing peers. So it might not just impact balance and falls, but also physical function in general.

And why might that be? Why would there be a relationship between hearing loss, hearing loss and balance and falls? There's several different proposed mechanisms in the cited paper here, the first being comorbid, vestibular, neural or cardiovascular pathology. So maybe there's something else underlying both the cause of the balance problems and the hearing loss. The second proposed mechanism would be decreased awareness of the auditory and spatial environment.

So if you're really focused on hearing in that environment, you might have fewer resources to attend to whether you're not being, whether you're being cautious of a crack in the sidewalk or a curb. So maybe just split attention can cause a fall risk as well. Inner ear issues like labyrinthitis could of course affect both hearing loss and balance, and divided attentional resources for locomotion and maintenance of your postural balance could put you at risk for fall risk as well.

And then this study also looked at 299 adults with bilateral hearing loss. These were adults who were 60 plus years old and they had both hearing aid users and non users in the sample. The authors noted a 50% reduced odds of experiencing a fall with hearing aid users compared to non users. So those who are using their hearing aids had a decreased likelihood of falling compared to those who are non users. So that's really Important to note, among the hearing aid users, they looked at usage, so they looked at consistent users and inconsistent users.

And they defined this as four plus hours, hours a day for consistent and less than that for inconsistent, which really, by my definition, I think an inconsistent user would still be using about four hours a day. But in general, the authors noted that there was lower fall risk for consistent users, which does suggest some sort of dose relationship. So it's not just that they're using their hearing aids, but using them consistently, and that can help drive down the risk for falls.

So what do our scope of practice guidelines say? So aaa, ADA and ASHA all have statements on balance and falls and how this falls into our practice. And this one's a little bit more obvious than psychosocial and psychological because of course, we have vestibular audiologists. But all three guidelines really say that we should be doing all of this work as part of a collaborative team. And we should be, of course, looking at physical exams and laboratory exams of the vestibular system.

We can do things like canalith repositioning, but really working as part of a balance management team to provide those rehabilitation services. And maybe even, according to ada, looking at habituation exercises, balance training exercises, general conditioning and adaptation techniques. So general conditioning will come up in a little bit as we talk about Starkey's balance assessment feature.

So we've got a couple features here at Starkey that really lend themselves to hearing loss and balance and how this relates to our patients. The first is the fall alert feature. So Starkey is still the world's first

and only hearing aid that has fall detection and alerts. So the way that this works, our hearing aids have an IMU or inertial unit, or inertial motion unit sensor in the hearing aids. And this can detect if someone has had a fall.

So it senses movement. If they've fallen, it can detect that it starts a timer on the phone so the patient can say, let's send that alert. Otherwise it will send automatically when the timer concludes. Or they can say, I'm okay, let's cancel, I didn't have a fall, or I did have a fall, but really I'm okay. So it helps to have that phone nearby the app open so they can interact with this fall detection module, a fall be detected.

This feature in general really provides a lot of peace in mind for our patients and their family members, because their family members would then be texted if the patient had a fall with the location and some details pertaining to that specific fall so they could follow up with their family member and get them the help they need. And here in Minnesota, this is actually really, absolutely needed in the winter, I mean, I have a fall on the ice probably once a year. So if someone could be notified that I had a fall and I can either say, nope, I'm okay, or nope, I'm stuck in the cold, please come help me, that would be very much nice to have and provide some assurance to my loved ones that I'm okay. And then the other feature that Starkey has is the balance assessment feature. And this is new with our Edge AI products.

So the balance assessment feature has really been informed by the Steady initiative. So Steadi is the stopping elderly accidents, deaths and injuries. And this is based on the American and British Geriatric Society's clinical practice guideline for preventing falls in older adults. And it involves a lot of things that Starkey's balance assessment didn't necessarily incorporate. So things like postural blood pressure or vision assessment, home fall hazards assessment, review of medications.

So that's not necessarily something that Starkey is doing, but would be done as part of the large study initiative if someone were at fall risk. So this is a comprehensive protocol to really screen patients for fall risk, assess modifiable risk factors and intervene if necessary. So Starkey really just looked at

several of these high level categories. So fall history questions, we do the timed up and go test, we do some standing balance activities. So we'll get into that next.

So through the My Starkey app, if you go to the balance assessment feature, the first thing the patient would do would complete the Stay independent questionnaire. So this is 12 questions that offer some insight into someone's fall risk. So things like I've fallen in the past year or I've lost some feeling in my feet. And then it explains why that matters in the screener here, the app, My Starkey would score all of these and then provide the patient with a summary of whether they have any fall risk or whether they're all clear for now. And I've even noticed in administering this with our participants that sometimes they will comment as they're completing the questionnaire that, oh yeah, I do have some numbness in my feet and I've never really thought about how that could impact my fall risk.

Or yeah, I do really have some trouble stepping onto a curb and I should pay more attention to that. So even just answering these questions can raise some awareness for our patients and allow them to take some of that fall prevention management into their own hands too.

So in the My Starkey app, you'd complete the survey on the left there, and then you'd get your initial screening results. At the end, you could proceed to the standing exercises if you felt comfortable and of course, had sign off from your doctor. So the standing exercises are in the upper right corner there. So there's four of them. The first, you stand with your feet side by side.

The second, your feet are offset slightly. The third, your feet are in tandem. That one's kind of tricky. And then on the fourth, you stand on one foot. You'd complete each of these for 10 seconds.

And the app would give you instructions in the hearing aid and then give you a timer. So starting now and then time for 10 seconds, and then it would say, exercise complete.

And then for the 32nd chair stands, that's on the right. So the patient completes as many chair stands as they can in 30 seconds. And this one is definitely kind of tricky. It's the one that feels the most like exercise when I complete it myself. And then finally, they'd complete a timed up and go test.

So for this activity, it would require a little bit of planning on the patient's part. They'd have to find that chair. They'd also have to measure out 10ft from the chair and mark that spot on the floor with some tape so that they could measure or walk to 10ft to that mark and then turn back and sit back down. So this is at a high level what the balance assessment feature entails.

So for those balance activities with the static balance, this is kind of more detail about what that looks like. Since it's using the IMU in the hearing aid, it will give them a score of pass or would you like to try that again? Depending on if it detects unsteadiness, if it believes that you put your foot down as you're standing on one foot. And we've shown really good agreement with the app scoring with the clinician scoring in the lab for the 32nd chair stand, there are some norms for this as well. So in the app, once they're complete with the assessment, it will give them a score whether they exceed the norms for their age and gender or whether if they don't, then it would flag it as something to work towards.

So for men, if you're in the 60 to 64 group, less than 14 would be below average. And for women, it would be less than 12. We don't have any norms below 60 since the steady protocol really is for older adults.

So for the timed up and go, the hearing aid and the app are looking to time how long it takes to go from your chair to the point on the floor back to your chair. And for an older adult who takes greater than or equal to 12 seconds to complete the tug, that does automatically flag them at risk for falling. The other things that the hearing aid will do is look for some unsteadiness as well. What the app and hearing aid can't entirely do, that you would do as the provider if you were to administer the the tug or timed up and go would be to look for things like short strides, whether their arms are swinging as they're walking, if

they're shuffling. So those sort of things that the app can't necessarily look for, but you could look for if you were to do this in the clinic.

And speaking of that, we at Starkey wanted to know what would these results look like if a patient did them independently without any clinician support versus with clinician support. So we looked at the usability and effectiveness of the balance assessment feature in both supervised and unsupervised environments. We had 14 participants. There was a demo group. So in the demo group, those seven participants had a clinician guide them through the balance assessment for the first time before they completed the balance assessment unsupervised on their own.

And then the no demo group completed it independently throughout the study. So as we reviewed, that balance assessment entails both the stay independent questionnaires, the balance chair stands, and the tug. And the results indicated that there was really no significant difference in scores across the groups. So the demo group or no demo group group or across environments. So whether they were supervised in the office or unsupervised at home.

So to me, this really means that you can complete this assessment independently and not have to take up valuable time within your clinic and office appointments and still get good results from your patients if they do this independently at home. Of course, if they're doing it independently at home, we'd always recommend that they do it with someone else at home and really only proceed if they feel comfortable and of course, check with their primary care before trying any new balance assessment feature or doing new activities at home.

I have like a tickle. I'm sorry. So, in conclusion, it was safe and reliable across settings. Though initial guidance did seem to improve some user experience, the patients that were in that demo group generally appreciated having the expertise of the clinician available in the beginning before they did it independently at home. Though having that guidance did not not significantly impact the results.

All right, and that brings us to our last module cognition. So what is the relationship between Hearing loss and cognition. This has been certainly a hot topic in the past couple years. First, let's try to understand the proposed mechanism between why these two things might be related. The first is sensory deprivation.

So if you have sensory deprivation that can induce changes to brain structure and function because of cortical reallocation, atrophy or neural deafferentation, and this prolonged hearing loss can cause physical changes in critical regions of the brain, which could impact cognitive processing. So the first sensory deprivation, and then we have information degradation. So hearing loss can create increased demand on cognitive processing to compensate for the degraded auditory input. Foot. So since you're not hearing as well, you're not getting as good of information to your brain, that can increase demand.

So increased auditory processing can draw on the cognitive buffer, reducing compensation of cognitive changes. And this information degradation theory does speculate that if you restored the audio input, you might see restoration of cognitive performance. The third mechanism is something called common cause. So this is that the hearing loss and cognitive decline stem from the same underlying mechanism. So that could be neural degeneration with aging or systemic vascular degradation.

So some tertiary cause is causing both the hearing loss and the cognitive decline.

In the Lansing Commission on Dementia Prevention, Intervention and Care puts out a report yearly. So the 2024 report speculated that if we were to address the modifiable risk factors of dementia, specifically these 14 modifiable risk factors, that we'd see a 45% reduction of dementia cases if we were to address those risk factors. So the risk factors are on the right side of the screen. So things like education, hearing loss, cholesterol, obesity, air pollution, et cetera. 7% of dementia cases are attributed to untreated hearing loss.

And they put that kind of in the midlife bucket on the right side of the screen hearing. So the Lancet was a little careful in their language, but they said that the evidence that treating hearing loss decreases the risk of dementia is now stronger than when the previous commission report was published. So they didn't say anything definitively, but they said there's growing evidence that treating hearing loss can decrease the risk of dementia. And some of that literature may have come from the Achieve study. So we talked about this earlier, but this is the main study that I think most people are more familiar with.

This was the randomized control study to investigate if hearing intervention slows cognitive decline. So they followed two risk factor groups for three years. The high risk factor group was at high risk for developing dementia, and the low risk factor group was less likely to develop cognitive decline. And they had two different arms of the study. So the both groups either received well fit amplification or they received healthy intervention education.

And then they looked at over the course of three years if there were any changes to their performance on cognitive screeners. So when looking at both the high risk factor group and low risk factor group together, there was no significant difference between the groups over the three years compared to the education intervention group. So hearing aids and education intervention resulted in similar findings over three years. But if we look at that high risk factor group alone, hearing intervention reduced cognitive change by 48% over three years compared to the group that just received healthy aging education. So that's a really big difference.

So it seems like there's something important here about your risk for developing cognitive decline and whether hearing intervention is likely to make an impact on your cognition. So then the low risk factor group, if you look at them alone, hearing intervention had no effect on reducing cognitive decline over the three years, again compared to the education only group group. So there may be a relationship here, but it may be dependent on your inherent risk factor for cognitive decline.

And this study is pretty fun too. So this was out of Anusharma's lab. So they looked at cortical visual evoked potentials for those who had untreated mild to moderate hearing loss and then were fitted with hearing aids and followed for six months. So these cortical visually evoked potentials are not generally that familiar to us in audiology, but essentially what they're doing is monitoring brain activity in response to a visual stimulus. So if you have untreated hearing loss, we know that there can be something called cross modal reorganization that happens.

So essentially, if the auditory centers of your brain are not getting input from your ears, there can be other senses that then take over that auditory center of your brain. So the theory here of looking at visual stimuli is that maybe if there is deprivation, the visual center would take over in that auditory center. And that's exactly what the authors saw. So if we look at kind of the first column with normal hearing, we're seeing good activation in the visual cortex. But then if you look at the group that had untreated hearing loss, the middle column, this is before they had intervention, we don't see such a clean response.

So it is bleeding into the auditory cortex, where the auditory cortex is then responding to visual stimuli. But when they introduced well fit hearing aids and followed them for six months, you see a much cleaner response to that visual stimuli, again, which looks more like the normal hearing group. So essentially we see a Reversal of that cross modal reorganization. They also did a MOCA at baseline and at follow up under both conditions. They did them with hearing aids.

So on audition is should not be a concern here. But they did still see that the MOCA scores improved by 71% or improved for 71% of participants and 10% stayed consistent. So that really goes to show and kind of points back to that information degradation theory we talked about, that if you do introduce better hearing with hearing aids, you might see a difference or change or improvement in your cognitive performance which we see here. And I think the important thing to note here is that these patients had

mild to moderate hearing loss, which we might not always think of as obvious candidates for hearing aids, but here we can see that there was some neural changes based on the hearing loss that reversed when we fit the hearing aids. So a good plug to try fitting hearing aids if you're unsure sometimes with some of those borderline cases.

And our scope of practice guidelines do have some statements here about cognition as well. So again from aaa, ADA and asha, they all mentioned that it's appropriate for us to be screening for common comorbidities of hearing loss, including cognition. So doing something like a MOCA is appropriate and in our scope of practice. And of course referring then to people, other providers who could potentially follow up if you did catch a cognitive issue or decline with your patient.

So we've got the MOCA on the screen here. This is the one that we use here at Starkey. It's been around for a while, has been translated into many languages too. If we do have someone that has a pretty severe hearing loss, we will sometimes use the MoCA H, which has a script that is written so that the person does not have to rely on auditory instructions to complete the moca. And another common one that's been around even longer is the Mini Mental State Exam, and that's also been translated into many languages.

So both are pretty accessible no matter where you are.

So this was a study from Black and Sousa from 2020, and they surveyed 1100 audiologists. And of those who responded, 88% reported that they do not administer cognitive screenings. So, 88% not doing cognitive screenings. But of those who do, approximately 90% worked in private practice, physicians offices, hospitals or universities. Hearing aid manufacturer is on there as well at 17.4%, which totally aligns with my experience here.

We do a MOCA on every patient that comes in for a hearing aid study. So certainly not large numbers of audiologists completing these cognitive screeners if they are completing the screeners, it's generally the MMSE or the moca, which we introduced on the last slide too.

So they asked them, if you're not doing these screenings, what are some reasons why you're not doing the screenings? So the first was things like not being comfortable administering the screening questionnaires, which is a very valid concern. If we're not being trained on this, it's hard to be comfortable administering it, not having time, which is also a very valid concern. The MILCA can take quite a bit of time to administer.

Some people incorrectly assumed that this type of screening was not in our scope of practice, which we've learned now that it is in our scope of practice. We're covered there. The other thing the authors noted was that the younger generation of audiologists are receiving or are more likely to receive training in this area. So we may see a shift in the upcoming generation of audiologists who've been trained in this area who might have an easier time implementing this in their practice. They might still feel like they still don't have enough time, but at least they'll be more comfortable with that screener.

All right, I see I've got one minute. So this is my almost last slide. So if you do do a cognitive screener, that can be helpful in informing and recommending something that Starkey has called Hear Share. So this is really the first app that lets patients who wear hearing aids share certain information with people they select. So then their family member would have the Hear Share app on their ph.

It would connect with the My Starkey app. And then the caregiver could see things like how often they're wearing their hearing aids. If they're up and about for the day, getting steps and standing, and also some wellness information too, like if they have had a fall, that history would be in the app as well. So this can really provide caregivers peace of mind that their loved one is up and at em for the day and wearing their hearing aids without having to call repeatedly just to check, hey, are you up today? You

have your hearing aids on.

So that can be an easy, non intrusive way to gather that information from their loved ones. All right, I've got one more slide just with takeaways. We reviewed a ton of information today. So just to summarize, the Person Centered Care approach aims to address not only the individual's hearing loss, but the impact that hearing loss can have on the emotional, social and physical aspects of the individual's life. Based on all the literature we found, we can really say that person centered care is trending so we see that patients and providers perceive value in incorporating those psychosocial strategies into their appointments and we'll remember that emotional support was rated highly by both groups.

The balance assessment tool provides an easy and effective way to screen for falls risk and in some settings up to 29% of audiologists are completing cognitive screeners but in general 88% of audiologists are not completing those screeners. All right so with that we'll open it up to the Q and A see if we have anything here. Thanks for sticking around for an extra minute.

Okay I don't see any open questions there can always send a note after if you do have any questions for me and I think with that I will share my my my references. I've got several of those so I'll just spend a minute on the screen in the next and I really thank you for your time and attention today.

Hope you hope you learned something. Thank you.