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Hearing Conservation: Hearing Protection for the Workplace and Beyond

Presenter: Janette Mongelli

Good morning everyone. Thank you so much for joining us today. My name is Dr. Janette Mongelli and I am a member of Starkey's Education and Training team. I am going to be talking with you today about hearing Conservation, so Hearing Protection for the Workplace and Beyond before we get started with the presentation though, I always just want to double check and answer a few frequently asked questions for the webinar.

Please use the Q and A feature for any of your questions. I'm monitoring that section and I will answer any questions at the end of the presentation. Today's course is for one CEU with your paid Audiology Online membership. After you complete today's course, go to your Pending Courses section of Audiology Online and pass that four to five question exam to earn your ceu. If you have any technical issues, do feel free to either call or email Audiology Online directly or use that Q and A window to report any issues.

Anna will also be posting the handout for today's presentation in the chat as a PDF, so please feel free to download that if you need it.

Now, I just wanted to mention quickly that the associated risks and benefits of everything we're discussing in today's presentation can be referenced here. This is a slide that you can read through at your leisure and it is included in today's handout.

After today's course, participants will be able to explain the impact of noise exposure and how to involve safety in the design of hearing conservation processes, Hearing Conservation Services and Products in the Clinic Identify which hearing protection devices are recommended for the patient based on their noise exposure and hearing loss, and to provide the rationale for providing hearing conservation services and products in the clinic.

Right now, when I first think of hearing conservation, I tend to think of individuals who work in very noisy professions like construction factory workers or, you know, military personnel like my mom who actually spent a number of years in the Marine Corps, and my uncle who spent more than 20 years as a jet pilot in the Air Force. But it's also important to think about those who have noisy hobbies. So, you know, maybe people who ride motorcycles, who love to go to the shooting range, who might play in a band. Have I mentioned that my husband does all three of those things? I am very known to yell out we're hearing protection anytime we're in a loud environment.

So you know, it's important to consider all of these folks who may have these noisy hobbies. Now what didn't necessarily come to mind at first for me when thinking about noisy hobbies or noise exposure in general is children, young adults, sports fans. Right. I'm a U of A graduate and my husband and I follow the Wildcats basketball teams. And let me tell you, when we are in the arena at McHale, it is so loud.

And my apple watch does tell me on a regular basis that I should be careful in exposing myself to so much noise. So. You know, there is a constant flood of information on the subject of noise induced hearing loss, especially in the last few years. It seems to be a really hot topic right now, and rightfully so. We're gaining more information about just how how loud the world that we live in has become on a daily basis.

From listening to music and earphones to doing yard work, having a night out at a concert or a bar, or going to a Wildcats basketball team game, you know, or taking even a workout class, we're constantly exposed to dangerously loud levels of noise. As we gain more information about some of these statistics, it's becoming more and more clear that we have to start thinking differently about hearing conservation and whose impacted by loud sounds. We're no longer seeing just military personnel or construction workers presenting with noise induced hearing loss in our offices. It is truly a very loud world out there.

Now the definition of noise is a sound, especially one that is loud or unpleasant or that causes disturbance. You know, I don't know about you, but I tend to think of music that I don't like as being noise or the sound of my German shepherd barking. You know, when anyone dares set foot on our street. Although I do try to explain to him that other people are allowed to live here, he doesn't quite seem to understand it though. That is definitely a source of noise in my daily life.

Now for our purposes, any, you know, noise is going to be any sound wanted or unwanted at levels loud enough to cause hearing damage or harm. So really noise can be any sound in any environment. Even if it's a sound that we typically enjoy, like music or something that we want to listen to, you know, even like the sound of an engine or something to a car mechanic. Excuse me while I cough.

Sorry about that. Now the CDC reports that as many as 40 million. Oops, sorry. That as many as 40 million adults under the age of 70 in the US show signs of hearing loss in one or both ears as a result of exposure to loud sounds. That is approximately 12% of the population.

Now even more alarming in my opinion is the fact that 1 in 16s at this point has a permanent hearing loss due to noise exposure. Now what that means is that in every A middle school or high school classroom, it's possible that several students already have hearing loss. Now, my son is 12, sometimes I think going on 20, sometimes going on 5. Kind of depends on the day, but this is definitely something that's on my mind as well, particularly as he gets more into gaming. Now, let's just take a look at the stats here.

A US survey of 500 teenagers aged 13 to 19 found that 88% of those kids admit participating in activities that they know may damage their hearing. 40% are around dangerously loud noises during events. So that could be something like concerts or sports games. 46% of these kids experienced ringing, roaring, or buzzing or pain in their ears after engaging in risky hearing. And 50% of young people listen to their music or other audio too loudly.

Now, if you do have younger kids at home, I know that there are headphones that have a volume limit on them. That's what I purchased for my son. So just a thought, if anyone has kiddos out there that they're concerned about. Now, beyond that, we know that there are many connections between our hearing health and our overall health. This is an area that's been really widely studied and is important to note that the impact of continuous noise doesn't just stop at the ears.

This area is termed non auditory noise effects, referring to effects of noise beyond those known to damage hearing. Now, the first of these is annoyance, right? And this is probably the most common response. This is stemming from noise interfering with daily activities. It makes sense, right?

Being exposed to noise, especially that which you can't control, can be annoying. And while it may start out as a small annoyance, it can build over time and cause fatigue, irritability and stress. Another issue here is cardiovascular disease. Now, long term exposure to environmental noise affects the cardiovascular system and it may even cause hypertension and stroke. The reason why is it's the body's physiological response to noise exposure that includes increased blood pressure, changes in heart rate, releasing stress hormones, and all of these things can eventually cause an imbalance in homeostasis.

And the result is that they can increase the risk of hypertension, arteriosclerosis and strokes.

Cognitive performance is another thing that we might not think of. One study looking at children who are exposed to chronic aircraft, road traffic or railroad noise at school showed that these children had poorer reading ability, poorer memory, and poorer performance on standardized tests. And the last thing that we as hearing providers tend to think of is communication interference, right? The fact that noise can interfere with or mask speech, communications, and warning signals isn't anything new. If You've been to a concert or a loud restaurant, you know from experience just how tough it can be.

But noise exposure can also interfere with safety, especially when you're thinking about the high incidence of accidents and fatalities on the job for those people working in noisy occupations. So now that we know who noise induced hearing loss can affect, let's turn our attention to what things look like clinically. We want to pay close attention to these three features. A case history of noise exposure. An audiometric notch centered around 4,000 Hz.

Although it can be around 3,000 or 6,000 Hz in some cases in the industry, this is typically referred to as a noise notch, right? And then tinnitus. Loud noise exposure can also cause tinnitus. And a study from NIOSH found that people who work in manufacturing industries have a significantly higher risk of tinnitus. And the majority of cases may have been preventable.

Since the leading cause of tinnitus is noise exposure. There's also this interesting topic of hidden hearing loss. Kujawa and Lieberman have several studies that show that some children and younger adults, despite having a clinically normal audiogram, have difficulty understanding speech in noisy environments. So while a traditional evaluation might not reveal hearing loss, there may be some cochlear abnormalities that may explain why people are having difficulty hearing a noise even with no documented hearing loss. Now, this is a bit of anecdote, but I will say clinically, when I performed hearing evaluations, you know, noise monitoring and whatnot, for osha, I often saw patients who presented with tinnitus before any hearing loss was observed on their audiogram.

So that tinnitus tends to come before the hearing loss. So again, that tinnitus really should be, you know, that should cue us in to what's going on for sure.

Now, noise exposure is very underestimated. I do feel like this quote does a great job of summarizing, coming up, why noise induced hearing loss is often overlooked. The effects of noise are often underestimated because the damage takes place so gradually. Loud noises have become so common

in our culture and there are no externally visible changes. People have traditionally not appreciated the serious impact of noise induced hearing loss on their daily living until they're frustrated by a permanent communication problem or ongoing ringing in their ears.

Now, this happens all the time, right? How many times have you gone to a concert or a wedding or sporting event and thought to yourself, wow, this is loud. I should be wearing hearing protection. But, you know, then you think about how every other time you've been in that situation, you've been fine, right? Not fully acknowledging that damage may have been taking place in a very gradual way.

As professionals, we know better, and some of us still do this. So think about how often this may happen in the general population without any realization that something may be wrong.

Now, how loud a sound is and how long you're exposed to it are two very important factors when it comes to calculating potential risk. In general, as the intensity of the sound increases, the amount of time in which you can be exposed to it without risk decreases. The exposure time really does matter. There's actually a couple of other variables to take into consideration here. Is the signal a continuous signal or is it an impulse sound?

What's the spectrum of the noise? How far away are you from the noise source? Also, think about whether there are other insults that could intensify possible damage. For example, has there been any exposure to ototoxic substances in the environment? Are you on an ototoxic medication?

Do you have a history of previous noise exposure? So while I'll be focusing today on level and duration, these things that I've mentioned, they're all important factors to keep in mind. Now, one term you may see as you're learning more about hearing conservation is the Time Weighted average, or twa. It is the average of noise exposure for an individual over an eight hour day. Another term you'll see throughout this presentation and when you're learning about hearing conservation is dba.

We use an a weighted scale here called DBA to describe the relative loudness of sounds as perceived by the human ear with a correction for frequency. All of the decibel values that I'll use in this presentation are expressed in dba.

Now, getting back to our auditory system. We know that the human ear is able to hear a wide range of sounds. On the screen is a visual scale of the loudness levels that individuals with normal hearing can detect and process and tolerate, ranging from 0dB to 140dB using the A weighted scale. Now just a note for you, these images aren't to scale. The DB scale is logarithmic and it's difficult to demonstrate here on the slide using these graphics.

So do just keep in mind that this is an example and not a to scale image. So the threshold for normal hearing is anywhere from 0 to 20 dB, sometimes even softer than 0 dB. Typical conversation occurs anywhere from around 60 to 65 dB. And then on the high end of the spectrum, the threshold of pain is around 125dB.

How loud does a sound really have to be? And how long do you have to be exposed to it before you're at risk for a noise induced hearing loss. Well, there are several organizations who have developed damage risk criteria and we'll be discussing those organizations shortly here. Now for our purposes today, we're going to use the NIOSH criteria, which assumes that long or repeated exposure to Sounds at or above 85 DBA can cause hearing loss if you're exposed for longer than eight hours without the use of hearing protection. A few examples of environments that are at about 85 decibels.

Now this is going to be like busy city traffic, you know, a school cafeteria at lunchtime or a vacuum cleaner. Now, eight hours sounds like a long time and hopefully you are not vacuuming for eight hours straight. Although if you do have German shepherds, which I do, two of them, you might actually be vacuuming for eight hours. However, this is really, you know, the length of an average workday. So

using this criteria, with an exchange rate of 3 decibels, right.

Every time we increase the volume by 3 decibels, the amount of time we can spend in that environment is reduced by half. So if at 85 decibels we can spend eight hours, that means increasing the volume to 88 decibels, we can only spend four hours and so on. Okay, now what I want to do is kind of crank up the volume to 91 DBA here. Our maximum exposure time without hearing protection is 2 hours, hours. Some common sounds that are about 91 DBA, a lawnmower or a hairdryer.

I often think about this in terms of folks working in salons, that is lots of hair dryers all day, right? It can also be the volume in the cabin of a loud commercial airplane. Now I do quite a bit of traveling as a trainer for Starkey, so I am often flying, right? So this tells me that I'm at risk for some hearing damage. And that is why I always wear noise canceling headphones whenever flying.

Right. Now what happens then if I were to increase the volume here to 115 DBA. Now when I think about the incidence of teen hearing loss and how it really has become such an epidemic, I think about wireless headphones. And how loud can some of those devices actually get? Well, the spec sheets for some popular earphones show that their maximum output can be as high as 115dB.

This is where those output limiting headphones come into play, if you have interest in those. So at that level of sound, the amount of time that we can safely be in that level There is only 30 seconds. Okay, now These values are important because this is likely what is contributing to that big spike in teen hearing loss.

Now, finally, we're going to think about impulse noise. This is going to be any noise that's 120dB or louder. Right. These can potentially result in immediate damage. Examples include firearms.

Right. The average level depends on the type of gun. We're looking at a rifle for about 138 decibels, and if you have a shotgun, that's about 160dB. Now, just for reference, a jet engine at takeoff is 140db and a firecracker is about 145db. So these are things that we have the potential to encounter.

And sometimes it's tricky. We don't always know, you know, when a firecracker is going to go off, but anytime that we can protect our hearing, we really, really want to do that. Okay. Now we know that noise induced hearing loss can be immediate, right? The result of one excessively loud incident, or it can gradually creep up from repeated noise exposure over time.

Sometimes it's temporary, sometimes it's permanent, and it can affect one or both ears. Regardless of how it might affect you, one thing is for sure, noise induced hearing loss is something we can reduce or prevent with effective hearing conservation practices. Noise is the most common modifiable environmental cause of hearing loss among young and middle aged adults. And there is a lot that can be done, whether you're a company trying to mitigate the risk of noise induced hearing loss among your employees, or you're an individual who's concerned about protecting your hearing, or a hearing professional who's trying to bring awareness to the issue and protect your patient's hearing.

So what exactly can we do? What are the fundamentals of hearing conservation? Well, when possible, the number one solution is to remove the source of noise or at least reduce it. A lot of hearing conservation programs in the workplace are aiming to do this by moving machinery to different locations or updating equipment to something quieter. These are called engineering or administrative noise controls.

When it comes to recreational activities. You can recommend listening to music at a choir volume, for example. But as we know, completely removing the source is not always possible and it's not always a recommendation that's going to be followed. You can't tell a music lover to stop going to concerts altogether, and you can't tell a hunter to stop hunting. So that leads us to our next best option, which is

the use of hearing protection devices.

We are going to cover that topic shortly as well. Now, beyond that, we want to educate our patients and the general public and serve as advocates for this issue. We can ask for lower volumes in public spaces like restaurants and movie theaters. We can work for stronger occupational regulations that reduce noise. And for those already affected with noise induced hearing loss, our goal is to prevent the hearing loss from hurting our patients communication abilities and having a detrimental effect on their overall health.

The best tool we have for this are hearing aids for those who are candidates as well as oral rehabilitation.

Now, there are a number of organizations that are major players in this field of hearing conservation. Each of these organizations has specific suggestions and guidelines when it comes to hearing conservation. There's osha, that's the Occupational Safety and Health Administration, which many of us are likely familiar with, niosh, which I mentioned previously, that's the National Institute for Occupational Safety and Health and then caohc, the Council for Accreditation in Occupational Hearing Conservation. These organizations have done so many great things for hearing conservation and they're all very involved in these efforts. One of when it comes to hearing conservation in the workplace, these groups have done a lot to educate and motivate employees and companies.

I would definitely encourage you to check out their websites and read their literature if this is a topic that you'd like to learn more about. So how loud does a sound really have to be before it's capable of inducing damage and potentially causing hearing loss? Well, that kind of depends on who you ask task, right? Different organizations have different criteria. This graph shows the breakdown of national criteria based on the organization.

So OSHA has a more liberal approach when it comes to how loud and how long is permissible for noise exposure, with the aim to prevent hearing loss in 2/3 of people. So you can see here, OSHA's regulations state that 90 DBA is going to be the sound exposure level and then it has a 5dB exchange rate. Now NIOSH, their criteria, assumes that just 8% of people will have noise induced hearing loss under their guidelines. And the World Health Organization is the most conservative and protective. They aim to eliminate any permanent threshold shift at 4 kilohertz.

So this graphic also shows the exchange rate for each organization. So for niosh, which is listed in the center with an exchange rate of 3 dB, every time the noise level is increased by 3 dB, the amount of time a person can be exposed to that level of noise is cut in half. Now, when you're at 85dB, you're safe for eight hours. And then as I mentioned previously, if you increase it to 3dB to 88dB, you're safe for four hours. So this continues on.

Right. If you increase it again to 91dB, you're safe for two hours. Now, just be aware of the exchange rate for these different organizations, as OSHA's exchange rate differs from NIOSH and that World Health Organization permissible exposure is based on sound level and time. But don't forget about distance and the other variables that we discussed previously. So how do we actually measure sound and noise levels?

How do we start our prevention efforts? Well, first we need to figure out if sounds in the environment exceed the 85dB tipping point that we outlined earlier. We actually do have some readily available measurement tools. Now, the first that you're likely familiar with is a sound level meter. So this is a specialized instrument and it's used to measure environmental sound to ensure safe levels fall within recommended exposure limits.

So typically this is a handheld device. There's an external microphone and there are many types of sound level meters. Some of them are for specific environments and uses. Right. However, these are

for more detailed use.

This isn't really something, you know, a casual person's going to have. This is not typically for like shop owners, hobbyists. This is going to be something that's more used professionally in a hearing conservation program. There are also personal noise dosimeters. So these are body worn instruments and they are actually used to measure the noise exposure for an individual.

This is particularly helpful in workplaces where employees are mobile, you know, where they may be walking around in different areas or where noise levels fluctuate over time. So this, this device, it will provide a calculation of data, right? Like noise dosage, the time weighted average, minimum and maximum levels that the person has been exposed to. Now, for someone, you know, more casual, I will admit this is me. There are several apps for smartphones out there.

So one is the NIOSH sound level meter app. So this can be used with the smartphone's internal microphone. You can also connect an external microphone if you wanted to. Now this meets the requirements for general purpose SLM use when it's paired with an external microphone. This gives us informational screens on noise hazards, hearing protection and hearing loss.

You can also see on the screen here it does give us the time weighted average and the dose, as well as your total runtime and the level of sound at that moment.

Now, Starkey also has an app, Starkey and sound gear called soundcheck Live. So this lets you find out if noise around you is safe or if it's potentially harmful to your hearing. And this uses the sound Check Live sound level meter. This lets you learn about environmental noise and how it can impact your hearing. So there are a number of different sort of articles within this app.

There are informational pieces on the basics of noise that includes like frequency of sound, volume and duration. There are some articles on how noise can affect hearing. So noise induced hearing loss, IDUs, hyperacusis. Right. And then there are also some tips for protecting your hearing.

Okay, I want to shift gears a little bit here and just discuss some hearing protection devices and their characteristics. There are a number of different devices out there. Now, about 70% of people who are exposed to loud noise never or seldom wear hearing protection. So let's think about that for a minute. Considering that we know that approximately 40 million Americans show signs of hearing loss from noise exposure, this statistic is pretty concerning.

Right? But. But it also points to why so many people are affected and it shows us how much work there is to be done in terms of improving our hearing conservation efforts.

Now, a lot of hearing protection devices have a noise reduction rating or NRR listed on them. The NRR describes the average sound level reduction or attenuation that's provided by a hearing protection device in a lab test list. All non custom earplugs are required to list their NRR per the US Environmental Protection Agency. And in general, the higher the nrr, the greater the devices will attenuate the noise. But since the NRR is based on lab testing, it doesn't take into account the fact that the devices might not fit properly.

That is why the level label includes the caveat when used as direct lab. Okay, so case in point, what comes to mind when you think of hearing protection devices? Now, I tend to immediately think of foam earplugs, right? They're easy to find. They're in every drugstore.

They're inexpensive. The problem is they're rarely worn effectively. So this chart shows the amount of protection that's listed on the box across several different foam earplugs versus the amount of real world protection you get when you wear it incorrectly. So you can see this is quite a difference from the

projected NRR versus what is actually being worn or which NRR is achieved when folks are actually wearing them. So, you know, the big disadvantage is that the amount of attenuation is very variable because it's very dependent on proper insertion and proper fit.

Now, how many times have you seen people wearing hearing protection or even hearing aids and they're sticking halfway out of their ears, right? I cannot tell you the amount of restraint that it takes me when I happen upon those folks not to just go on you know, go up and pop them back in their ears. However, I will tell you, if you haven't done this, it's really not socially acceptable to go up and put your fingers in people's ears. Ask me how I know. Of course I always ask beforehand, but I do get funny looks.

Now, the NRR for properly insert store bought non custom plugs can be up to 31 decibels, but often they're not fit properly, which gives far less protection than you'd expect. So some sources recommend reducing the nrr. Before attempting to estimate the effectiveness of a device, the printed NRR on the package tends to overestimate the amount of real world protection. There is a recommended calculation, you can search online to find this. I believe it is NIOSH that has this recommended calculation that you can use for reducing the NRR to estimate its true protection in the real world.

So what is the right amount of attenuation for an individual? Well, it's a balance between protection and allowing for communication. Again, different organizations have recommendations for the goal of attenuation, right? So one example shown here has a goal of attenuating such that the noise level is brought down to 75 to 80 DBA. But you know, why might overprotection be a concern?

Well, it can interfere with communication, right? Too much attenuation is going to interfere with someone's ability to communicate. It can compromise hearing of environmental sounds and warning signals and it can even contribute to the wearer feeling isolated. So, so all of this could lead the individual to only wearing their hearing protection when someone like a supervisor or a parent is

watching. It could also lead to the misguided decision to only partially insert the protection in order to hear better.

So both under attenuation and over attenuation can be safety concerns.

Now in terms of what's available on the market today, there are many, many options. There are non custom earplugs. So there's disposable foam, pre molded and banded. There's also earmuffs, there are custom earplugs and electronic protection. So we're going to go through each of these in a bit more detail.

Now for foam earplugs, there are pros and cons to these, right? They're disposable, they are single use. So they're not designed to be reused multiple times. This is just something to consider. I see people who use their foam earplugs and then they put them back in their little case that is not the intended use for these.

Now the highest noise reduction rating for foam earplugs is 31 decibels. They're easy to carry, they are affordable, right. They're light. So there are benefits. But again, it's important to note that the attenuation depends on proper insertion.

Now I just learned recently the recommendation with any foam earplug is once you've sort of squished it down and inserted it into your ear canal, you're supposed to hold it there for about 30 seconds to let the foam expand without it coming out of your ear canal. That wasn't something that I knew previously and this is my industry. So I don't think lay people, you know, who are out using these are necessarily going to realize that that's the recommended use. So it's just something to keep in mind. Now there are also pre molded earplugs.

These are washable and they're reusable. They do come in multiple sizes. So with the foam earplugs, you know, you kind of squish those down and then they expand to fit your ear. These pre molded ones differ a little bit because these flanges come in different sizes. They also come in different materials as well.

Now the attenuation for these will depend on the size selection. So if you've chosen, you know, tips that are too small, you won't have a good seal, right? You won't get the same amount of noise attenuation. On the other hand, if you choose tips that are too large, they're not going to be able to be inserted properly. So that will also affect that noise reduction rating.

I do like these because they have typically this lanyard. So you can have them sort of sit around your neck if you need to. You won't lose them. Them. These are also lightweight.

They tend to be pretty comfortable. So this is a good option as well.

Now there are also these banded earplugs. I like these in terms of using them in intermittent areas. So if you know you're going to be in an area that's loud, you can put them in you, you know, are walking through or you spend whatever time there. Then you can take them out and let them rest along your, your neck after you're out of that environment. I will say though that the occlusion effect is the most noticeable with this type.

There is a pretty deep insertion. So we do note that, you know, our own voice is going to sound much louder. These do tend to have a lower attenuation. So the highest noise reduction rating that I was able to find for this type was about 18 dB. Okay, now earmuffs are really great for a lot of folks, particularly children.

I love to go to Disneyland, and as you might anticipate, it can get fairly loud there. I've seen a lot of parents who have these earmuffs on their kids, right, to protect their children's hearing, and I love to see that. I always want to give them, like, a big thumbs up from your friendly neighborhood audiologist, but they would think I was weird, so I refrain from that as well. So. So earmuffs do fit directly against the head with cushions, right?

And the cushions are going to be either filled with foam or liquid, and they're held in place with that headband. Now, some of these are meant to be worn with the band over the head, while there are others that can be worn with the band behind the head or even under the chin. So the advantages to these are that the amount of attenuation is less variable than with foam earplugs, plugs, because it is harder to wear earmuffs incorrectly. There are folks who do it, though, because as we know, it takes all kinds. Right.

It's also easy for employers to enforce the use of these earmuffs because it's really easy to tell from a distance if someone's actually wearing them. So these do typically have a universal fit with this adjustable headband. And. And they're pretty easy to find, a lot harder to lose, and there's less maintenance that needs to be done with them. So the highest noise reduction rating I was able to find for these was 31 decibels.

Now, they can end up feeling kind of hot or heavy if you're using them for a long time. So some folks find that they can become uncomfortable. You know, perspiration can collect in hot weather, so it might be difficult to wear these, these at the same time as you're wearing a lot of other safety gear. So my intention here is really just to kind of go through the pros and cons of each type of device, and then that leaves you, the professional, to have a conversation with your patients about what's appropriate for them. Now, there's also the option of using dual protection.

So this gives us a combined noise reduction rating of about 5dB more than the higher rated of the two device devices. So if you are using disposable earplugs, their noise reduction rating is 27 dB. And then you've got ear muffs over them, and their noise reduction reading is 31 dB. You would end up with a noise reduction reading of approximately 36 decibels. So this does not double the noise reduction rating, although wouldn't it be cool if it did?

Now, dual protection is recommended in specific circumstances and it's in order to provide overprotection. So NIOSH recommends that dual protection is used only when the time weighted average is 100 DBA or above. Okay. Now moving on to some custom options. There are custom solid earplugs and these offer more consistent attenuation.

They tend to be easier to insert as well. Now, solid earplugs can be a great option for anyone who's looking for a really high noise noise reduction rating, right. As well as comfort for all day use. Now, Starkey and Sound Gear offer this type of hearing protection with a noise reduction rating of 27 decibels. They're available in a variety of colors.

There is a corded option that allows folks to leave them hanging around their neck when they're not in use. Now keep in mind that for the best results, you would need to have a really good ear impression. For these that's past the second bend. And we want to capture external ear anatomy like the concha, the tragus and the antitragus so that the earplug can make a really good seal. Now these are typically made of silicone, right?

They can be an ite size or smaller and they are comfortable and they're reusable for many years. There are also these high frequency noise filters, sometimes called hawks. Now these have a patented chamber and it gradually attention attenuate sound to appropriate levels. And it does this by reducing high frequencies, but allowing low frequencies through. So these are recommended for general noise reduction while preserving speech.

So for flight attendants, motorcyclists, sports enthusiasts, right. Now these are made of a high strength silicone. These are also offered by Starkey and Sound Gear. And that noise reduction rating is going to vary between 19 to 22 dB.

There are also musicians, custom musicians and filtered earplugs. Okay, so one of the biggest reasons why professional musicians and music lovers don't really like wearing hearing protection is because traditional earplugs don't do a great job of preserving sound quality. Instead, they end up muffling some frequencies more than others. And that results in a less than ideal musical experience. So that's why these are a great option.

They're called flat attenuators, right? Because they attenuate across all frequencies equally, rather than just the low and mid frequencies. So the flat attenuation preserves the nuances of music, so it makes that sound much clearer and more natural. Now, Starkey and Soundgear do offer this type of hearing protection device. There's a mini filtered earplug.

It's one of our, our highest recommended and most popular custom options. Now there are also three filters available and they're interchangeable. And these are, there are different recommendations for these depending on the type of music instrument that you're playing or you know, the music environment that you're in. So for percussion from either your own instruments or if you're playing near other percussions, Anywhere from this 17 to 26 DB filter is recommended. For sound crews, music teachers and marching bands, the Recommendation is the 17dB filter.

And then for vocalists and string instruments, you'd probably be comfortable with anywhere from 10 to 17 db filters. So these filters are all removable and replaceable in the field. So you can easily switch between these options depending on the environment. They are produced in a very high strength, tear resistant silicone material. And they're available in a number of colors.

Okay, so here is just a quick look at Starkey and Sound Gear's offerings. When it comes to custom ear molds. We do also make things like sleep earplugs. Those have a 27 DB noise reduction rating. And these are made of a soft material and they keep a low profile for comfort when you're sleeping.

We also offer swim plugs, bugs those seal out water and they float when they're dropped in water. But we're not going to go in depth on those. Just wanted to let you know that they do exist. So if you ever have a question about a specific patient case or need a recommendation on which type to use, I would just encourage you to call into Starkey for some help. Our technical support books are amazing and anytime you call Starkey, a live person will answer the phone.

And if you don't know who you need to talk, talk to. They will help you out with that. And I know this because I used to call into Starkey frequently when I was in private practice. Now the final category I wanted to mention today is electronic protection. So these can be an earmuff style with integrated electronic technology to reduce noise.

So there are generally two types. So there are some that are level dependent. So, so they're going to attenuate high, high levels of sound, right. While allowing in low to moderate sound. There's also a noise canceling option as well.

So that is going to be active noise reduction. So the average noise reduction rating for this type of electronic protection is 19 dB.

I wanted to take just a few minutes to go through sound gear's offerings. So sound Here is the name of Starkey's line of hearing protection devices. The active protection hearing devices feature advanced digital technology that's incapable of enhancing sound eight times over traditional hearing protection devices. And they use sound activated compression to trigger instant automatic suppression of any

noise over 95 dB. It's important to note that Soundgear is hearing protection protection.

It's not hearing aids and protection combined into one. So as compared to competitive devices, Sound gear is a great option for a couple reasons. It is competitively priced and it's able to take care, take advantage of some of Starkey's really great resources, like our wax protection system. It's available in a variety of form factors and the devices are pretty sleek, really, not very bulky. Now, we don't vent these products so you know that the user is getting the adequate hearing protection that they need.

Our Soundgear products really represent Starkey's commitment to hearing protection and conservation.

So there are two form factors that are available. There are active and then there are passive custom form factors. So The SoundGear Custom ITE does come in two technology levels. There's the Phantom and the the Silver. We're going to go through that in a couple minutes here.

There also we do have a new. It's called the Sound Gear Shield. This is an instant fit cic. This is the lightest and smallest dynamic digital protection on the market. And it does come in a recreational and industrial form factors.

We also have our passive custom options as well, some of which we've discussed. So the first sound gear option I wanted to mention is the all new Soundgear Shield. Now these are stock devices and they're completely in the canal. Devices that are ready to wear. Soundgear Shield devices have multiple fitting options, so they don't require a custom impression or any kind of ear mold.

And they're ready to wear right out of the box. There are two different models available. We're calling them recreational and industrial Industrial. Now these models are identical in every way except for the amount of gain and output that they provide. Both models can be used with either the tri flange buds,

which you can see here in orange, and they also have an option to be used with foam buds.

So the great thing about having both coupling options is that the shield devices can fit a variety of ear sizes and shapes. Now, the tri flange buds provide a noise reduction rating of 20 and the foam buds have a noise reduction rating of 32 decibels. Now, as I'm looking at this slide, I realized that under industrial it only says there's that noise reduction reading of 25 dB. They also can be used with those foam buds and you would get the 32 decibels noise reduction in that industrial form factor as well. So the industrial model has a lower matrix of 80 and 8.

So it's an 80db output with 8db of gain. And it's recommended for industrial settings like noisy factories. You know, even, even in dentistry. Right. Because it is OSHA compliant.

Now we also have that recreational model and that has the higher matrix of 9315. So that's a 93db output and 15db of gain. The reason that we offer these two models is because they don't have a volume control. So they, the gain and the output are fixed. Okay.

We do also have that silver in the custom ITE that I mentioned. This is that 95 and 30 matrix and this uses a size 13 battery as well. The noise reduction reading for these is 24 decibels. We also do offer the Phantom, which is the first and only truly wired wireless Bluetooth custom rechargeable ITE. So there are four potential, or four rather programs here.

There is a normal program, a maximum protection program. This is two times the compression to increase the suppression of low frequency sounds. There's a high frequency boost which provides another five to six decibels after 3,000 hertz. And then there is a mute function as well. Well, so if you do have more questions about this, I'm happy to hang around and answer them.

In the interest of time though, we are just going to continue onward. So these are pretty easy to fit. There's no programming that's required by you. And then there are, as I said, those four pre programmed memories. And there is maximum noise reduction in these devices and it's applied to all memory memories now, just like hearing aids.

Right. The only effective hearing protection device is the one that is worn properly. So that's something just to keep in mind. So I wanted to shift gears a little bit and just discuss hearing conservation in the clinic. You know, in the past if I received a referral for, you know, an occupational noise monitoring, I was a little intimidated and sometimes not sure what was expected of me.

So I wanted to go through some of these basics and just, you know, reassure you. This is absolutely something that you can do. Now when we think about OSHA versus workers compensation, these are two very different. You know, there are two very different goals here. So OSHA is intended to prevent hearing loss in the first place and workers compensation is Litigation for compensation toward rehabilitation.

So essentially, if a company is referring to you, they're likely getting audiometric monitoring from their own occupational hearing conservation tech. But if you're getting that referral, it's an indication of concern for their employees and they're really wanting your professional judgment here.

Now, this absolutely is in the audiologist scope of practice. This is outlined by OSHA as well as ASHA here. Now, at the bottom, bottom of this ASHA sort of column, you'll or you'll see here, this is recorded on the OSHA log 300. Well, the OSHA log form 300 is just the form employers use to record occupational illness or injuries throughout the year. Okay, so when you are seeing these folks in clinic, this should look pretty familiar, right?

We're doing patient intake, case history, otoscopy, be hearing evaluation, referral if it's necessary, and then writing up our report. So, of course, if you're doing scheduling your patient intake, you really want to know what the reason for referral is, the type of environment that they work in, and what the noise level might be like. And then you'd always want to request a copy of their past audiograms because you do want to look at that potential threshold shift. Okay, so when we're doing case history, we want to avoid assuming that all hearing loss is work related. So it's always important to ask about noisy hobbies, if they have served in the military, if they do any recreational shooting.

Right. And any other employment in noisy environments. So you also want to ask about their hearing protection use, so how often they use it on the job currently, when the last time was that they used it, you know, the circumstances under using it. And then we always like to double check on any potential ototoxic exposure as well, because as we know, hearing loss can result from a variety of causes. So of course we want to do otoscopy.

This is super important if folks are using HPD regularly. Cerumen impaction is pretty common. So always, of course, want to do that. We'll complete our hearing evaluation, including pure tone testing and speech testing. And then of course, we want to report our results.

Now, this isn't always straightforward, right? You do need to note any standard threshold shifts. So when I say decrease, what I really mean is like a worsening of 25dB or more at 2000, 3000 and 4000. And this is as compared to a previous audiogram. So that is why you do want to get copies of their previous testings as well.

So you do want to rule out any changes that are non work related and then provide, you know, in your professional opinion, your justification for these conclusions. It's based on their history, any changes in hearing, etc. Okay, now for additional follow up, you do want to discuss using hearing protection device and counsel on using it effectively. So practice insertion, if you are able to discuss the appropriate

times, you know when to wear that. And of course, if they do have hearing loss, you'd want to discuss your hearing aids, if that's an appropriate conversation to have.

So again, when we're thinking hearing conservation, we want to remove or reduce that source of noise, want to use hearing protection devices, we want to educate and advocate for our patients and then provide clinical rehabilitation when needed.

Now, our typical patient demographic is made up of people with hearing loss, right at an average of 69 years old. But the demographic of people who can benefit from hearing protection except expands far beyond that. So when you think about it in that context, offering hearing protection is a great way to attract new customers and patients into your practice. By expanding the services you offer, we're able to shift our demographics and see patients who have different needs and different lifestyles. Now, a lot of the time those folks don't have hearing loss or they're not candidates for hearing aids yet, but we're able to provide them with help in the form of hearing procedures protection.

So this not only opens the door for greater traffic into your office, but more importantly, it can create a customer for life as that person is going to return to you. And of course, they could be an excellent source of referrals. The key here is really getting out in your community. It can be beneficial to talk to businesses that attract the people who you're looking to help. So think you know music venues, concert halls, gyms, local gun clubs, and shooting ranges, stadiums and other sporting venues.

So go to those businesses, tell them about what you offer and give them your business cards. Maybe they'll put up a display with your information, right? And then if they have an event or if they want to refer someone for help, they'll know who to go to. Okay? There are many resources out here for use in your waiting rooms, for advertising and all.

So don't be afraid to let your community know that you're just as concerned with prevention of hearing loss as you are with treatment of hearing loss. Hearing loss. We have a quick video for you and then we're going to wrap up.

So again, here are three organizations that have really great information if you want to continue learning about hearing conservation. We really just scratched the surface today. Along with that, CAOHC has a great training and certification program if that is something that you are interested in. We are wrapping up today. Thank you again so much for joining us.

Us. I don't see any questions in the chat, but I will hang around for a few minutes if you do have any questions. And remember to go to your pending courses and take that quick quiz when we're done here so that you can get credit for your ceu. Have a wonderful day and thank you again for coming and spending it with us this morning.