(Captioner Standing By).
NCHAM (Captioner Standing By).

NCHAM
>> For those of you who signed on early, you're in the right place for today's webinar, entitled audiology for non-audiologist working in and supporting EHDI activities. I see our interpreter is on. Thank you for your services today. I'm Will Eiserman, and I'm going to be the facilitator today. And Terry Faust is going to be our primary presenter.
>> Good morning, and thank you for joining. >> Good morning or afternoon.
>> That's right. It is afternoon. Thank you.
>> I don't know where people are right now. [Laughter]
>> Well, I'm Mountain Time. So 10 minutes. [Laughter] I'll say them the first time but I'll use the abbreviation just for otoaucoustic emission, I'll try to call it OAE afterwards. And the same with Auditory Evoked Response.
>> For those of you who signed on Earl, we're making sure our interpreters and captioner is acquainted with some of the termnologies we'll be using today. But you're in the right place. We haven't started yet. We will be starting at the top of the hour in just a few minutes. You're getting a little preview where we're headed today as we share the content with interpreter and captioner that we will be covering.
>> I think that's it.
>> Thank you. I appreciate it.
>> Well, we appreciate you. I always feel like our interpreters and captioners in the world don't get acknowledged enough. And I just don't think that's right. I just want to always say a big thank you to those of you who offer these services. You're human beings who are part of this whole communication process, and I don't want you to be too invisible.
>> I'm going to be talking a little bit now as our start time approaches. We know people are signing on during this period. And I want to give everybody a chance to adjust their volume settings to their liking. Being aware you can activate the captioning feature by clicking on live transcript and then making adjustments accordingly. You can also adjust the size of your PowerPoint display screen along with the visual of the interpreter there. Terry, are you going to be on camera today?
>> No.
>> So Gunnar, can you just thumb, whatever you call it?
>> Yeah, Paula is spot lit. So she will be visible for everybody.
>> Okay, and then everybody else will not be there?
>> Yep.
>> Okay. Thank you.
We'll be starting at the top of the hour. You're in the right place for today's webinar. Which is entitled audiology for non-audiologists. Working in and supporting EHDI activities. The webinar is going to start here shortly as brought to you by the National Center for Hearing Assessment and Management

 

known as NCHAM. N CHAM. And I did that for the benefit of our interpreters and captioner. NCHAM is our organization at Utah State University. We have a grant from HRSA, that funds us as the Early Hearing Detection & Intervention National Technical Resource Center. Another alphabet soup of EHDI NTCR. That was the Cal step was was the Cal sten nicks in preparation for use of too many acronyms I think in the world that we all function in. Calisthenics. [Laughter]

Today's webinar is going to be recorded as our all of our webinars. And what that means is that if anything disrupts your attention to today's webinar, or if you happen to think of people that aren't attending live who could benefit from today's content, you can direct them to our website infanthearing.org in the next couple of days. And they will be able to livestream, not live steam, but stream today's webinar. So keep that in mind as you participate today. We'll be starting shortly in just couple of minutes here. (Recording in progress).

>> Well, I like to welcome everybody to today's webinar entitled audiology for non-audiologists working in and supporting EHDI activities. My name is Will Eiserman. And I am the Associate Director of the National Center for Hearing Assessment and Management known as NCHAM at Utah State University. NCHAM is funded by the the maternal detection and early bureau or the EHDI NTCR. And in this capacity, we offer periodic webinars on topics of relevance to the EHDI system and those of you who work within it. Today's webinar is focused on an introduction of audiology for those who are not audiologist helping us understand some of the basics that are important to have a grounding in as part of our work within the EHDI system.

Before we get started, I want to let you know that today's webinar is being recorded. And that means that if anything disrupts your full participation in today's webinar, or if you think of people who aren't attending live for whom you think the content that we're covering today would be a benefit, then you can send them or yourself to infanthearing.org, our website in the next couple of days where you'll be able to stream it and view it in its entirety. So keep that in mind as we proceed through today's webinar. I want to give a shout-out to our interpreter and our captioner today who are here to help us make these sorts of learning opportunities as accessible as possible. So thank you to those individuals who are in our service today.

And so as we proceed through today's webinar, we're going to ask you to hold your questions until our presenter opens up the floor as which time you'll be invited to raise your question and I will read them aloud, and then we'll have our presenter respond. So, sorry about my dog in the dog in the background suddenly. [Laughter] All right.

Terry Faust is our presenter today. Terry, I'm going to ask you to introduce yourself and your background. And so take it away, Terry.

>> Thank you, William. It's a pleasure to be with all of you this afternoon. And I welcome you to this webinar, audiology for non-audiologists who work in and support EHDI activities. As William said, my name is Terry Faust and I'm a pediatric audiologist and speech-language pathologist, and have spent the early years in my career working in pediatrics at a large pediatric hospital that serves the inner mountain west in Salt Lake City Utah and I worked in hearing screening program and have been a

 

consultant for the National Center for Hearing and management as well as their Early Childhood Hearing Outreach or ECHO initiative which supports and provides screening for hearing for early childhood.

So I know this is at or after lunch. So I really appreciate your attendance this afternoon. So with that, let's go ahead and get started. I do remember early on when I was working with some children, parent of a newly identified child who was profoundly deaf. He said to me, "I feel like I'm being thrown into your field as an audiologist, and I never wanted to be one." and I just never forgotten that, because it's an acute reminder of all the things that we talk about and we often talk among ourselves and with words and acronyms that many of us don't understand. And so with that today, I like to really bring us to have a discussion with these terms and concepts within audiology.

So today, we're going to cover the following information. We like to define and discuss the types of hearing loss that people and children experience, we like to also talk about the types of hearing tests that we use to diagnose a hearing loss, and then we're going discuss audiograms or how we visually map out hearing sensitivity and then we like to discuss the treatment of hearing loss, the amplifications, and interventions such as hearing aids and cochlear implants.

But before we do that, let's define or talk about all the various hearing related providers that work in this field. It can be really somewhat confusing. So outside of general medical or general practice providers, the more hearing-related providers are these. So let's just start right here at the top. As you calmly heard of ENT or ear nose and threat specialists. Their technical name isn't otolaryngologist but this is a doctor or specialist who special specializes in the medical treatment or treatment of therapy for the prevention of disease, or disorders, or injuries in the ears, nose, sinuses, throat, respiratory, and upper air ways. All of those kind of head and neck systems.

They also practice in the realm of neck and neck oncology or cancer treatment, facial, plastic, reconstructive surgery and treatment of hearing and voice, and they're fundamental areas of their expertise. So these providers have specialty training. They're required to have board certification, which is usually 5 years in addition to medical school. And so you'll often see a designator that they're board certified.

Now, with an audiologist, the next one there, that's a healthcare professional who's trained really in the area of hearing. So they're trained to evaluate hearing loss and all the related disorders. And that does include balance, balance disorders. It includes things like ringing in the ears, and they also focus on rehabilitation or helping individuals with hearing loss and related disorders.

An audiologist will use a variety of procedures to test hearing and balance functions and also to fit and dispense hearing aids and other helpful devices for hearing. You'll see a designator with them of Au.D., which is just stands for audiology doctor. So it would be an Au.D. And you may often see some initials in addition such as CCC-A. And that is a certification from the American Speech and Hearing Association. It stands for certificate of clinical competence. But it's that kind of national certification standard.

Then we have support providers that help us all. The first one there you can see is an audiology aid. And that's really an assistant or technician that's been trained to complete certain tests or other

 

support tasks that we need usually by or for an audiologist. And they're directly supervised by an audiologist. But you may see that term audiology Aide. Another one is audiometrist. And that test where we put headphones on and have you raise and lower your hand in response to a sound? And they're also usually supervised by an audiologist or ENT, or another provider.
I will tbhoat note this title or this use of audiometrist is commonly used outside of the United States. We tend to use audiology aides a little bit more here. The last one I wanted to go over or last two is a screener. And these are common in the EHDI world. And these are people that have been trained in administering hearing screening tests. And they're trained usually by an audiologist or someone experienced in the screening method they're using.
They're trained to use the screening equipment to place any ear probes, or headphones appropriately. And then to run the screening test. Now, they may make a judgment in whether or not someone passes a hearing screening, usually in the case of a pure-tone screening. In most cases the test they're using will be automated. So they don't interpret the results of any full testing. And, again, they're usually supervised or overseen by an audiologist.
Now, the last one you may encounter or be familiar with is a hearing instrument specialist. And often you may be more commonly known as hearing aid dealer or you may hear that are description as well. I would sawrnl summarize it by sale and disb you may see designator such as board certification and hearing instruments sciences. See their credentials. Well, let's go ahead and move on. We're guided by benchmark standards of care. Meaning, we have guidelines that have timelines. So that we can intervene and help by early as age as possible. We want too have hearing screen. We want to complete their diagnostic audiology and otoaucoustic emission examination. If there is a hearing loss present, we want to identify it by 3 months. And then we want to fit hearing aids if necessary. By 6 months, we want them enrolled in babies early intervention services, whatever that may be according to family choice. I would just close with a note here that these times lines are minimums. We always know that early is best. And why is that and well, when we talk about these times lines and earlier is better, it's really actually really critical. We can't emphasis it enough. The earlier we intervene the better. And the reason for that is really simply that the rate of growth in development in the first year of life is really unmatched by any other time during postnatal development. So as your baby grows, his or her brain is developing rapidly and tiny synapses are really tiny little electrical connections in the brain are forming. And the amount of stimulation that your child receives directly impacts the amount of those connections that are formed within their brain. And would just note the creation of these connections, they're really virtually complete after the first 3 years of a baby's life. And these findings are supported by brain imaging techniques such as this PET scan here. These are really images that show the changes of brain maturation that occurs in that orderly fashion as a child grows and develops.
>> William, on my screen it's showing the former slide. Thank you. Okay. So hearing loss is described by the parts of the year that are affected. So it can be temporary. It can be permanent. And it can be fluctuating. It can change. And even mild and moderate hearing loss can significantly affect the ability to hear and process speech and speech and language development. Now, an audiogram can use that

 

word there, we can show that to you coming up. But audiogram is how we graph or map out in display hearing sensitivity. Now, let's move on to talking about the hearing tests. Now, we use hearing tests to get the information that about someone's hearing that we just talked about. And these hearing tests help us know how much loss or impairment there is. So how much of hearing sensitivity is affected. What type of hearing loss it is. So where does it occur along that auditory system? And then what's the configuration or the shape of the hearing loss? And I know that sounds kind of strange, but what I mean there is that when we think of sound as low-pitch sounds, up to moderate and high-pitch sound, how are each of those frequencies or pitches affected with the loss of hearing? And so configuration really just means what frequencies or pitches are affected.

So we use this information then to make treatment and intervention recommendations. So let's take a look at the ear with regards to what I just said. This diagram is probably familiar to many of you. But let's go ahead and review the ear for just a quick moment. So to review, let's look at the ear as sound as we start over on the left side with the blue waves. Let's look at the ear as sound travels through. It goes through the outer ear and on your slide, it says pinna. But that's just the other term for outer ear. So that sound is going to fundamental to that outer ear and it's going to go into the ear canal. Now, that ear canal is where sound travels in and it starts the process of sound stimulation and hearing. Now, think about your own ears. This is where earwax or ceru men can block the ear canal. And we have the loss of conduction of hearing due to blocked canal simply due to earwax. As we think about types of hearing loss and as it goes through the ear, keep that in mind. And as a sound travels through the ear canal, it's next going to hit or push in on the eardrum. And when it does that, it moves and stimulates the parts of the middle ear. If you can see on your slide, we have those 3 little bones that we probably all learned about in elementary science. But it moves and stimulates those bones. You can have problems here as well. You could have a hole in the eardrum, or some other problem. Now, once we're in the middle ear space where the 3 little bones are, they will move with the eardrum. And they push in on the inner ear. And the inner ear on your slide is that blue snail-shaped portion. And that's the inner ear or as noted here the cochlea. What that does when it pushes in the inner ear, it transfers the sound further along the auditory system. Now this is where what we would call a sensorineural hearing loss if that happened to be located within the cochlea or the inner ear. But overall, when sound goes through from the outer ear through the canal, through the middle ear and then stimulates the inner ear, that's really how it goes, then it stimulates the auditory nerve and goes up to the brain and that's what we interpret as sound, and then we attach meaning to it.

Okay, so, these are the types of hearing loss then that match what we were just talking about. So we would have what we call a conductive hearing loss or a loss that's related to sound transmission in the outer or middle ear. Then we would have a sensorineural hearing loss, which is really related to the inner ear. That's where the hearing sensitivity would be affected. And then we could have a mixed hearing loss. That's really where we might have problems with both sound transmission through the outer portion of the ear, the middle, or the inner ear. And then you can also have what we call auditory neuropathy. And that is a problem with that neurotransmission of sound. Two other things to note, when we have hearing affected in just one ear, we call it a unilateral or a hearing loss in one ear. If it

 

affects both ears, then we call it a bilateral or it affects both ears.
Okay. Well, let's now move on to the test that we use. So as audiologists, we have a variety of tests. But they generally fall into two main basic types. And you can see those here. We have objective tests and subjective tests. And what that simply means is a subjective test is one where we have to make a judgment. So I, as the audiologist who is providing the examination, I would need to make a judgment based on an observation. Meaning, I will look for an appropriate response from that infant or child. I'm looking for a desired auditory behavior that indicates and is consistent with hearing.
So it looks at the end of the hearing process. That means it's gone through all the system and interpreted and we look for reaction to sound, or response or interpretation of sound. So let me give you an example. We would expect that an infant to be surprised or startle. Startle noise when presented tar at a certain level. We would make a sound at that level, and I, as a trained observer would look for that baby to startle.
Objective tests are ones where there's no need for that observation and interpretation on the part of the audiologists. We have objective tests for middle-ear function, for inner ear function, and for function of the auditory pathway up through the brain. Now, when we combine all of our tests, we really have four main categories of tests. And if you can just look at them here on your slide, we have tympanometry which is simply that's a measure of middle-ear function. We use a test called tympanometry to evaluate middle ear pressure, the status of the middle ear system, and we use it to confirm or rule out a problem in the conduction of the hearing loss. So a conductive or temporary hearing loss. What I mean by temporary is most of us have known children who may have chronic ear functions, and their hearing may fluctuate whether they have fluid in that middle ear or not, it may get worse when it's fluid-filled or better when it's not. Otoaucoustic emission, the next test or OAE, that is a test that is indicative of inner ear function. So if you recall that snail, that snail shaped portion of the ear. That provides measurement of sounds that are generated by tiny little hair cells in the inner ear or cochlea. We have the ability with OAE testing to stimulate and record that response of those hair cells that are in that inner ear. And we measure and record those in the ear canal. The next one is called Auditory Evoked Response, or ABR testing. This records responses to sound from the brainstem. And we record, we actually record these waves, these brainstem waves that occur in response to sound. So those three right there are, if we were to test you based on the prior slide, those would be objective tests, because I can get a measured response that I don't need to interpret a behavior from the child. Now, the last one is a larger category called Behavioral. And is that it is where we look for those behavioral responses to sound. Let's come back to our ear really quick here and just review this. So the outer ear, we look for any problems in there, and usually with the light or otoscopy. And what most often we would see with outer ear issue is some sort of blockage with that canal, most commonly earwax. Go to the middle ear now, and we assess middle-ear function with the test I just talked about, tympanometry. Okay. Now, these two easier are associated with conductive hearing loss or a problem just simply with the conduction of the sound up through to where we want to stimulate the inner ear. Now, go to the blue snail-shaped portion there. That's inner ear function, which is assessed by OAEs. The test that we just talked about. And then beyond the inner ear to the brainstem is where we look at

 

the auditory system and assess it using ABR. Now, let's talk about each one of these in detail. And let's start with otoaucoustic emission. So what are they? They're actually really cool. I know that's coming probably from an audiology geek here. [Laughter] But they do measure, as I've mentioned before, they provided some measure of inner ear function. And it's a relatively recent addition in kind of the history of our test battery or the diagnostic test that we use to assess hearing.

The existence of emissions was discovered by man of named David Kemp in the late 1870s but it not a routine part of clinical testing until the late 1990s. And just very simply, otoaucoustic emission are sounds that are generated by the inner ear, those little tiny sensory hair cells that are in the inner ear. And we can record that response in the ear canal with very small microphones. Let's go to the next slide. Here we go. So very simply, we just put a small probe. We fit it snuggle in the ear canal and that probe delivers a sound stimulus. So that probe makes a small sound stimulus and goes into the ear canal. If then a response often referred to as echo from the inner ear can be measured. Babies are easiest to test when they're younger and they're quieter and distracted. And it's a great test for early childhood.

Now, let's move to ABR. So what is an ABR? Auditory Evoked Response audio audio tree or ABR is how travels along the hearing nerve pathways from the ear to the brainstem. And we measure the response of that.

We start at a higher level, and we try to measure that response and then we reduce the loudness level so we can try to see where we get a response at the softest or quietest sound that the child's ears can detect at various pitches. And let me give you an example here of an ABR. So on this one here, what we call threshold search is just simply looking for the quietest level that we can get that measurement. So if we start at the top of this slide, you can see this big waveform. And you see an arrow. I've written a little down pointing arrow at the top of that peak. That's a waveform I'm looking for. Now, we notice here that this is a 50, that top one is 50-decibel which is a normal conversational sound level. One of my slides shows we bumped up one.

>> Yeah, I was looking for a slide that had a waveform on it. Is this the right slide?

>> No, go back. Yes, sorry. I had to go in the wrong way. Go -- it should be slide 19. There we go. Let me orient you back to this. So these are the waveforms that we would measure when we try to find the quietest sound level that a child would respond to. So the top you see a nice big large wave. That's at a normal conversational level. And then we get quieter, and quieter. And the very bottom one is at 10-decibel. It's quieter than a whisper. And you can see how the waveform shape change. And so we look at those. And we try to find the quietest level that we can get a response. So now let's go to the next slide. And I want to show you just a little bit of a difference here. Okay. So here's an example of an ABR where we have normal results on the left. And then we have one that's consistent with a mild hearing loss on the right. So in both of these, we start out tar normal conversational level. This particular test, we started at 60-decibel of sound. And the response is there at both. But as we got quieter, the response on the right disappears but remains present on the left.

Just to give you an idea of kind of how that test works. Now, let's go to behavioral tests. Behavioral tests, these are all the ones again, where we are looking for a child's response to sound. And we have

 

them listed here in terms of development. So how a child may be able to respond developmentally. The first one is visual reinforcement audiometry. This is where we use visual reinforcement, things to reward the child such as lights and moving images, or toys. And we try to pair a response, the child's response to child. And we reward them. And we condition them for give us the response that we're looking for. This is typically used in children's 6 months to 2 years. Now, the second one is called conditioned play audiometry. It's very similar, only this time we use a play task to condition to the pairing of sound. So for example, we'll pair a response such as putting a block in a container or stacking, or rings on a holder. We pair those with sound. And once they have the task, they know when they hear the sound, for example, beep, beep, beep, and then they put a puzzle piece in the puzzle. Once they are consistently conditioned with that, then we go as quiet as we can where they can still provide a reliable response. And typically, this is used with children 3 to 5, really just as appropriate to the individual child.

Now, the last one is pure-tone audiometry. And it's used with children. And typically when we talk about this, it may be used in school screening for example. It's typically used with children who can reliable raise their hand or otherwise give a response such as pushing a button and response to a perceived sound. And typically, used with children 3 years of age and older up to adults. All right, let's now move to what I referred to earlier with an audiogram. So an audiogram is a map of hearing. Now, as you can see here, what we have is frequency or pitch across the top of the audiogram. So look at those numbers on the top. Those frequencies are pitches ranged from low tones of 125 Hertz across the top to the right where you see 8,000 Hertz. So you can think of the frequency portion of the audiogram like a piano keyboard. The sounds on the left portion are low-pitched and base quality sounds. With the lowest pitch on the audiogram being 125. And then as you move to 8,000 Hertz, the sound gets higher and higher in pitch and has more of a a tenor equality. If you look down along the left side of the audiogram, that's where we talk about intensity or loudness. So the further you go down, the louder the sound becomes. So for example, at 10db sound, look for the 10 on that graph, and you can follow it across for every pitch. At 10-decibel sound is a soft as whisper or even a touch quieter. While 110 goes all the way down there, look at those loud objects that are placed there to give you an idea how loud those sounds are. But 110 will be almost loud as an airplane.

So to put this in perspective, we have familiar sounds plotted on this slide. Revealing it at what frequency and loudness level, these sounds typically occur. So if you look at the lawn mower, it's kind of around 100db and it's a lower pitch. So that's why it's there around 250 as farrest pitch and 100 as far as loudness. And you can look at those others.

Now, the shaded area that looks like a banana, we actually call it that. We call it the speech banana. But that's where this sound of speech take place. So if you look closely at that banana-shaped area, you'll notice the sounds of speech occur approximately from 15 to 50db, kind of that normal range of speech. 40 to 60db curve there. And typically, most of the energy is going to be between 250 and 8,000 Hertz.

I will note that vowels tend to be lower pitched and louder than consonants are. So take a look here at this audiogram. Here we have the speech sound overlaid on top. Okay, so let's take a look at these.

 

The vowels tend to be lower frequencies. So if you look around 500 Hertz there, you can see they're louder. And they tend to be made with your full voice. Okay? Now, go to the right. Go over up by 4,000 Hertz and look at those. Those are the sounds that don't have voicing. We typically don't use our voice to produce the sound F. F. Or S. Sss. Or TH, th. But notice that a mild loss would make it harder to hear those sounds and we know that high-frequency sounds give us the crispness and clarity. They add that to hearing speech. >> Terry, this is William. Can I ask you to clarify one thing?

>> Uh-huh.

>> So audiogram is useful in today's presentation to understand various degrees and types of hearing loss. The audiogram is also used for an individual evaluation of hearing. So that for a given child, it would actually be used to plot out the types of hearing condition that a given individual has, correct?
>> Yeah, we'll talk about that in a moment. Coming right up.
>> I just want to make sure people were understanding this isn't just for instructional purposes. We use this to describe the individual's hearing abilities.

>> So take one last look at this. Because as we go to the next slide, we'll see when we talk about how hearing is affected. The point I want you to remember here is that moderate to severe hearing loss misses most of the speech sounds in this speech banana. Okay? So now let's go to the next slide. And this is exactly what William was talking about. This is how we look at hearing levels, and we plot every child's individual hearing in both the right and left ears on the audiogram. And so when we do so, if someone has normal hearing, the results for the right and the left ear will occur in the yellow range. That's considered normal hearing. If any of the responses occur between 30 and 40db, excuse me, and it can be, we consider slight to mild to be about 25 to 40, then they're considered to have a mild hearing loss. A moderate hearing loss will go from 40 to 70. And so if their responses for the right or left ear is in that range, they would have a moderate hearing loss.
And so it goes down. So now note that when we're looking at that severe, the pink and the profound, that's where we have real difficulty getting any response at all. Think about that profound hearing loss range. It's where airplane at 110 could not be heard. So, again, to summarize here, we will plot out the hearing at every one of those frequencies that we can for both the right and the left ears. And then we can plan from there based on that map of the measurement of their hearing. William, anything you like to add?

>> And when you say plot, you're going to indicate the quietest sounds that the child is able to hear in each of those areas.

>> That's correct. Umm-hmm. When we record, results by ear and frequency, we're looking for the lowest or the quietest level that we can get a reliable response on the test that we use. Okay. Again,

 

just to summarize here, even a moderate to severe loss will miss most of those speech sounds. I've drawn a line across there. So in this case, if somebody has this moderate to severe hearing loss, and that means the quietest sounds they can hear are along the level of this red line, then they're going to miss all of those sounds that are above it.
>> Could you just take one moment and address what it means if the ears plot out very differently from the right to the left ear, we can think of a child as having a mild or moderate hearing loss. But, actual, it may be different from one ear to the other.

>> They're often different, and I can use a personal example here. I have a 6-year-old granddaughter who is profound in one ear and has a cochlear implant. And then her loss in the other ear is more in the moderate to severe range, and she wears a hearing aid in that ear. I use that example in that we can have interear or between the ear differences. And we will want to separate those ears and get those measurements for the hearing sensitivity and each of those ears as accurate as we can. And then we plan intervention for those ears based on that individual ears hearing. And there's a great research base that shows that amplifying or providing assistance to two ears has better outcomes than to one, if that makes sense.
>> And that's why it's so important that we always screen both ears and evaluate both ears, because hearing isn't just the combination of what the two ears are able to do.
>> It can actually be someone deceptive, because you can have a child with a unilateral or hearing loss in one ear. But what we might see behaviorally is the response of the better ear. And so you might think, oh, things are -- there's no hearing loss there. But when we screen those ears independently, we can find that we may, indeed, have a hearing loss in one ear, and we know that when that one ear, if we're able to intervene, we can get better outcomes than if we don't. And one last comment and then I'll let you continue. From a follow-up standpoint, which many of our participants are interested in, we don't want to ever dismiss the significance of follow-up when one ear has passed. It's great. It's good news. Don't get me wrong. But if the other ear didn't pass, that still needs priority attention.

>> Yes, thank you, William. Now, let's move to treatment and intervention. And we're going to talk here in the realm of audiology and the interventions that audiologists have expertise in. But as we do so, there is, you know, if we go back to how we started out and we talked about all the people and the professionals, and the people that have a role, our medical intervention is typically provided by our ENTs, or otolaryngologist. And that includes such things as surgical treatment. Is there a surgical treatment that could remove the, for example, if it's a conductive hearing loss, a problem in getting the sound as it travels through, perhaps there's a middle ear surgery that could fix or repair things and we could have an improvement in hearing.
And often treatment for chronic middle ear disorder can alleviate that either fluctuating or permanent or conductive hearing loss as well. When those things either cannot be helpful or can only be partially helpful, then we can look at other options. Those options for us, as audiologists are hearing aids, cochlear implants, and FM systems. And I like to just talk about them briefly. Now, along with this

 

though, if you recall when I talked about that timeline, you know, that 1-3-6 months. And so as part of that timeline, recall the intervention is so important. So we also want to get a child into early intervention as soon as we can. And our goal is language. And there's a variety of wonderful intervention methodologies that can help depending on family choice. So we want to work with a professional team to support families. And so as audiologists, we typically work with early interventionists, people who have been trained to provide early intervention and language support to babies and young children.

We work with speech-language speech-language pathologists, and we work with educators for deaf and hard-of-hearing, and all of these various team member are really crucial to obtaining the best outcomes. Now, let's go into, let's review briefly those technologies that I mentioned in the previous slide on helping such as hearing aids. Let's start with hearing aids. Let's take a quick look at some of the audiological interventions here. Now, with hearing aids, they typically have just these main parts. Now, hearing aids are really marvelous pieces of technology nowadays, but each even as they have changed, we still have these components. We have a microphone, which is simply the part of the hearing aid that the sound comes into it, it gathers the sound, and it sends it to the amplifier. Now, this is where a lot of the technology is really cool, because that amplifier takes that sound, it makes it louder, it filters it. We can program it. We try to program it to match that individual's hearing loss. And then it sends it out through the speaker. And so if you've calmly calmly seen a hearing aid, let's see. And it sends it out, and often a hearing aid has a small tube. It can either be in the ear, as you've seen with many adults, or often children will have a behind the ear hearing aid that sits behind the ear. But it sends that sound through the tube and into the ear canal. All hearing aids has a power source as well. So it's typically a battery. Though we're seeing many more rechargeable options being made available. As you can see here, there's a behind-the-ear hearing aid with a red ear mode. And you can see there's just a wide variety of colors. I'll share with you my 6-year-old granddaughter right now is in a pink phase. So we have a pink hearing aid with a glittery pink ear mold. But there's all kinds of fun options for kids. Now, let's move on to cochlear implants, or often referred to as CIs. And it's an electronic medical device that replaces the function of inner ear.

So if we think back to the test for inner ear function, which is OAE, which looks at the function of the inner ear and the tiny hair cells. This is where a cochlear implant actually goes. There's a small electrode that's inserted into that snail-shaped portion of the ear. And it replaces the function of those non-functioning hair cells and portion of the inner ear.

So unlike hearing aids, which makes sound louder, cochlear implants, they do the work of the damaged parts of the inner ear, the cochlea to provide sound signals to the brain. And cochlear implant works by using electronic technology that takes the place, like I said of those non-working parts of the inner ear. It kind of works like this. We have a sound processor. And that sound processor picks up sound. So on this slide, here's an example of one. It's that little hook where the number 1 is on your slide. That little hook is the sound processor. It actually is similar to hearing aid on this part of it where we have a tiny microphone that is sensitive to the sound. It picks up the sound. And it captures the sound, and it converts it into a digital signal. Then that digital signal, if you look on

 

number 2, those signals are sent across the skin to the internal implant. So you'll have a portion on the outside of the skin and portion that's buried and attached to the skull. That's number 3. And it just sends that digital signal through the skin, and then that's done with technology that's similar to the way a radio station broadcasts its signal just on a smaller scale. And then inside the inner ear, that number 4, that's where that internal implant, it converts the signal into electrical energy, and it sends it to an electrode array inside the cochlea. And then that electrode stimulates the hearing nerve and the brain perceives the signal as sound. Okay. So during the exploration, parents of some infants may wonder if their child is a candidate for a cochlear implant. And criteria for candidacy has changed overtime. But this slide shows the current criteria. And providers should confer with a cochlear implant team whenever there's any uncertainty about a child's candidacy. But you can see, we have to show there's a lack of benefit from any traditional type of amplification such as hearing aids. And then there's the age requirements. And then the degree of hearing loss needs to be severe to profound. And I will note that this slide, we could remove the word "bilateral" because they do approve unilateral or cochlear implants in one ear when only one ear is affected, and they have specific criteria for that. So current guidelines permit cochlear implant for persons two years and older that have severe to profound deafness. And in children 12 to 23 months with profound deafness.

>> Terry, in interest of time, if you could move quickly through these next couple of slides so that we have some questions, time for questions.

>> Yeah, FM systems are really just systems that allow the sound, allow us to improve or make the communication signal stronger in the back or competing signals weaker. So it helps with making a primary sound they need to listen to more clear and stronger. And these are often used in educational settings and schools. And then, really, to wrap-up. If we go to the next slide, here let's -- and what does all of this mean? And I just want to close this presentation that even when we have hearing aids and cochlear implants, and all of that, there are other things that we attend to. And one of those is distance. So you'll notice that here. And what we do is we try to assess how close we need to be to our child that has hearing loss in order to give them the strongest and the best signal. And so as we go down through, you can kind of look here. We just have this to illustrate we might have a listening bubble, the area where the sound is clear and strong. And we just want to be sure that we get close enough to the child.
We know when we decrease the distance by half, we get a 6-decibel increase in the loudness. And so we encourage everyone to be as close as they can. And we highlight the visual environment. We want to provide optimal seating and positioning. We want to be sure lighting is great so they can see well. And we direct attention to language sources. And then the last thing is things can change and so we want to monitor and manage continually. We want to plan for future needs. So we choose amplification flexibility. And we troubleshoot issues and problems that may arise, and we want to provide educational input and consultantation so we can best manage the environment and give that child the best opportunity to succeed.

 

>> And this is William. And I would adhering status can change not only for children who have a known hearing loss in one or both ears, but those children that might have typical or normal hearing at birth can change overtime as well during the early childhood period in particular, hence, the hearing you're hearing more and more about expanding EHDI to include the identification of hearing loss up to 3 years of age. If today's content, we're going to open up questions now. So feel free to type in your questions. The content of today's webinar is ex-panned more in an online module that you or others can look@infanthearing.org. Right on the landing page. You'll find audiology for non-audiologists. And you'll get a Certificate of Completion if you take that. It's a good resource, especially, for newcomers to EHDI. So keep that in mind. This is what that looks like.
And it's about, oh, what is it? 28 minutes in length to go through that. Terry, thank you so much. So, let's see if we have any questions that are coming forward here. Terry, can you go back to that individual test? I'll pull up that slide in a minute here. And talk about the age ranges for those tests?

>> Yeah, thank you. So, all of the objectives tests, if we went to slide 11, all the objective tests can be used across the age spectrum and have great utility across all ages. The objective test, again, all ages. The subjective tests, and if we went to slide 12, it would be all of those in that behavioral category. Those are the ones that would have different applications or different ages to them there. And so it depends. If we're doing pure-tone audiometry and they're able to respond, that would be ages 3 and up. And then behavioral response audiometry, we're looking at 0 to 6 months or little bit older, and condition play, you know, could be 18 to 24 months. It just really depends on the development and level of the child and that's where the skill level and assessing that also becomes important. But all the objective tests can work wonderfully across the age ranges.

>> This is William again. Here's another question. Does an OAE measure the degree of function in the inner ear or does it merely identify whether or not there is a concern?

>> Both. (Chuckles softly) So otoaucoustic emission or OAE testing has great utility. We can have a complete absence of otoaucoustic emissions and we can also have variability and strength in presence. For screening, we look at either presence or absence. And for other diagnostic needs, we will have full different diagnostic modules and things that we look at depending on what we're trying to assess.

>> The next question is can anyone purchase an OAE machine and screen newborns? Is there a place they must go to register?

>> This is going to be somewhat of a variable answer there, but we train lay persons to screen. And programs, early childhood programs, others at servient program can have lay machines. They don't

 

need to register the machines. Reason why I said it's a variable, the ability to screen in different states can vary. States have different regulations regarding that. Some have no, they don't regulate screeners and others do. So it would depend on licensing and other restrictions that various states may have.

>> Do you want to add to that, William?

>> The next question is. So you talked about hearing aids, cochlear implant, FM systems, what about ASL? Why do audiologists never mention ASL? D eaf mentors, deaf schools, or hearing parents of Deaf children?

>> That's a great question and I appreciate that. In our scope, probably, even what prompted that question is scope of practice, we focus often on the technology that we're asked to assess for, fit, and be part of. And that early intervention piece, that was on that 1, 3, 6. That's this critical part of this question. And audiologists in that -- and we didn't talk about referring to early intervention, but that is the piece or audiologists do need to make referrals so that parents who made aware of all the options? That includes mentors, Deaf mentors and educational programs and schools. And so that is definitely part of that information sharing and counseling piece. Asked.
>> The next question is, some of the families I collaborate with explain after a failed hearing test, they are recommended to wait a few months for the baby to get older in order to retest. Sometimes that waiting can range from 4 to 6 months. Due to the importance of testing as early as possible, what is your opinion about such recommendations?
>> Don't wait. That early intervention regardless of the support, whether it's listening in spoken language, whether it's American Sign Language, or any of the other options, our goal is to get language going soon as possible. And so I would not wait and waiting is not a recommendation. It could be if we are waiting for middle-ear infection to clear up and we may be on the course of antibiotic and we need time for that to clear. But other than those types of medical reasons to wait, we should not be waiting. We should get them back in couple of weeks and rescreened.

>> I put the slide backup about the 1-3-6 model to emphasize that for those new to the EHDI system, it's important to know that from a fiduciary responsibility, or a regulatory responsibility, the EHDI system is intended to identify and refer children to early intervention services that are then federally supported and delivered through the Part C early intervention system. The EHDI system itself does not fund or have any control over the degree or types of early intervention services that are offered. So sometimes when the conversation cut shorts of the types and degrees of different kinds of interventions, it's because that's where the hand-off occurs between the EHDI system and Part C. And that distinction is an important one that I think is not always understood about why we don't go deeper into the early intervention option. That's another system. It's, obviously, a critically important distinction but it's a different system and a different set of providers. >> Let's see where are we time-wise? We

 

are over our time. So thank you, everybody. Thank you, Terry, and to our interpreter and captioner for your time today. For all of you who have taken time out of your busy lives to be a part of this presentation today. Gunnar, our technical assistant is putting a link in the Dropbox, or in the webinar chat window to click on a survey. If you complete it, it will generate a certificate of attendance for today's webinar, which we hope you will do. And with that, remember this has been recorded and will be available on infanthearing.org in next couple of days. Thanks, everybody.