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Complex Pediatric Cases

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- [Christy] At this time it is my pleasure to introduce our first presenter, Dr. Jane Madell who is a certified audiologist, speech language pathologist and LSLs auditory verbal therapist. Dr. Madell is formally the director of the Hearing and Learning Center, in Cochlear Implant Center at the Ear Institute. Her clinical research interests include evaluation and management of hearing in infants and young children including hearing aids cochlear implants and assessment of auditory function and evaluation and management of auditory processing disorders. Dr. Madell has published seven books, numerous book chapters and journal articles. She writes the "Hearing And Kids" blog, for the Hearing Health Matters website. She is the recipient of AAA 2017 Marion Downs Award, for excellence in pediatric audiology. Thank you Dr. Madell for joining us today and at this time I'll hand the mic over to you.

- [Jane] Thank you very much. I'm excited to present this workshop with my colleague Joan Hewitt who is one of the most wonderful pediatric audiologists I know. And we're excited to do this and to teach you some of the things that we have learned. Learning outcomes first. As a result of this course, participants will be able to select the appropriate assessment measures for patients with complex histories or complex needs. Attendees will be able to evaluate multiple performance measures in order to plan and validate treatment and we'll be able to explain the value of both objective and subjective measures in working with pediatric patients. We have nothing to disclose. Pediatric audiology is complex just by the definition. Children are not as cooperative as adults. As we all know, some days they wanna play and some days they don't want anything to do with us. So we need to figure out what's interesting for them so that we can get them to cooperate and that includes making sure they're sitting, in a comfortable way and that the toys are not all over the place so that they get distracted. Children with hearing loss can also be a surprise. Adults come in. I said that wrong. Hearing loss in children can be a surprise. If a child isn't identified at birth it's confusing. Adults come in knowing something is wrong. Their hearing has been deteriorating for a while but families don't expect anything to be wrong. So when a child, either when a child is born or later identification it's almost always a surprise. So

we have to deal with the fate of the family also. Managing hearing loss in children is complex. Helping families understand the need for developing, the auditory brain is the first thing we have to do. Because if we don't get a child to build their brain we're going to have problems getting them to understand what has to happen. We need to be sure that the technology is providing sufficient benefit. It's not enough to just do real ear or electroacoustic measurements or to map cochlear implants according to the manufacturer's protocol. In addition to that we have to be absolutely sure that the sound is reaching the brain and we can only do that by testing. We need to help families and children accept and use technology and we need to help arrange for therapy to help children build spoken language skills. We also need to provide counseling and support for families and children. We establish the degree and type of hearing loss not for its own sake but to assist us in selecting technology. If a child has a moderate hearing loss, we know a hearing aid is gonna be enough. If a child has a severe hearing loss, we know they're gonna need a cochlear implant. But in between, there's a lot to figure out and it's not always easy.

So we do evaluations of type and degree of hearing loss to assist in selecting technology to planning management and to advocating for positive ideological outcomes, for the children that we serve. Validity and reliability measures are critically important, when we look at any test protocol. Is it doing what we think it's doing and is it doing it correctly? Audiology testing needs to be presented to other team members including the family to help them understand what kind of test results we've gotten. The classroom teacher, the speech language pathologist, any other therapists working with the child and the family all need to really understand what this audiogram means. I did an online course, for speech language pathologist yesterday and they were stunned to find out that children with cochlear implants also need FMs in the classroom. And it's just an example of how we need to be sure that everybody who's on the team is working together and has the same idea. So while verification is a critical part of the evaluation and we should never proceed without verification, validation is also essential and we should never proceed without validating that the

child is actually hearing what we need to hear. That the sounds are actually reaching the brain and that the signal is clear and not distorted. The whole point of technology is to get communication to the child's brain. We can't assume, we have to evaluate the child, we have to do real validation testing to make sure that we know that the child is hearing. Children speak what they hear. If their speech is distorted, if the speech they hear is distorted what they get to the brain is gonna be distorted. So we need to be sure that they're hearing what they need hear. Audiological interpretation of testing is to estimate the child's performance, not only in the test situation but to make appropriate recommendations for outside of the test situation for home and school. Now I'm going to turn this over to Joan Hewitt. I don't think Joan was introduced in the beginning so let me give you a one minute introduction. Joan is a teacher of the deaf and a pediatric audiologist. She specializes in cochlear implant mapping. She is the owner of Project Talk in San Diego, California and she is a brilliant clinician. I'm turning this over to Joan now.

- [Joan] Thank you so much Jane for that lovely introduction. And I don't actually own Project Talk, we are a nonprofit that was actually started by parents who wanted their children to have the opportunity to learn to listen and talk. So what are the outcomes of a successful technology fitting? I think Jane you actually handed over, a little early just because the extra slides got handed. Would you like to do this or do you want me to continue?

- [Jane] Again, I can't, oh, there we go. I heard that we were going to, that you were taking over on slide 10. Why don't you just take over. It's fine, you do it.

- [Joan] We know that hearing loss is, a neurological emergency and we want to minimize that deprivation as quickly as possible. We want to be able to stimulate the auditory pathways not only, just for their sake but so that we can grow those neural pathways, for cognitive development. Spoken language is really what we process in our auditory brain and spoken language is the platform, for cognitive development. You

all couldn't be sitting here listening, if you didn't have that spoken language and that auditory brain development and that cognitive development to understand my language. We want to maximize residual hearing and lay that foundation for academic learning through hearing just like every other child, in the classroom has. We also wanna make sure that children with hearing loss have access to distant hearing and soft speech. And that's because that's where incidental learning happens. Studies have shown that children learn about 80% of what they learn through incidental learning through overhearing. Someone doesn't set out to teach them the information, they overhear their parents talking about it. They overhear other people talking about it and they learn information that way. We want our children with hearing loss to have as much access as our children with hearing so that they can also learn incidentally and we don't need to teach them everything. Obviously, that technology is going to facilitate socialization, since socialization is based on communication.

We also want to make sure that the children are safe and comfortable with their technology. We always want them to be comfortable if they're uncomfortable, we need to go back and figure out what we need to change so that they can comfortably wear their technology. We always need to ask ourselves questions as pediatric audiologists. Did we use the correct test for this child's age and language development? Do we have enough audiologic data to make decisions right now or do we need to do additional tests? Do we know everything that we need to know about the child's auditory performance, without their technology and with their technology? Do we have enough information to plan the management to ensure that they're going to be able to benefit from the therapies and educational management that's gonna be recommended? Do the speech perception tests that we've selected provide sufficient information to assess if the child is hearing everything they need to hear and that information is getting to his or her brain to be processed? Because that is how they need to learn language and that is how they need to learn in a mainstream classroom. And are we explaining the test results clearly to the other team members including the family? As Jane said, we need to make sure that everyone on the team, including the

parents understands our results. I think it's so important and Jane agrees with me that everyone understand that real ear measurements are not the same as real brain measurements. What we really want to know is what information is getting to the auditory brain? We have amazing tests now like real ear verification, we have eSRT that we can use with cochlear implants, neural response measurements and these are all critical to programming the technology the child is wearing. But none of those tell us about what meaningful speech and language information is arriving at the child's auditory brain. So real ear gives us a good estimate of how much amplification a child needs, based on their hearing loss but everyone is different. The settings that are provided with the real ear measurements are an average and we find that a lot of people are not average. So those settings can't account for any unique, characteristics of the individual's auditory system. Maybe the child needs a little more high frequency, maybe they need a little less low frequency. Only behavioral measures are going to tell us exactly what the child is hearing. Only behavioral measures are going to validate the real ear or that eSRT or neuro response settings that we have made. We need to know what meaningful information is getting to the brain.

We both think it's so important for everyone to realize that hearing aids and cochlear implants are speech processors. They were designed to process speech not tones, not narrowband noise but speech. So only through verifying the objective measures with speech validation can we find out, if the prescribed response is enough? Just doing real ear or neural response or eSRT doesn't tell us that we have actually obtained the response that we want. If our aided thresholds and our speech perception is good, then we've validated our real ear measures. If our aided thresholds are not at the level as of Jane's famous string bean then we need to ask ourselves why. Is it a lack of access with the technology? Do we need to get new ear molds? Reprogram the hearing aids? Maybe we need different hearing aids. Maybe these hearing aids are not appropriate for this loss or do we need to move that child to a cochlear implant? We strongly recommend that there be behavioral testing with technology to assess the auditory function. We think it's so important to test speech discrimination with our

children as young as early as we can. Testing at normal conversational level at 50 dBHL with the right technology, the left technology and both technologies together. We also want to assess soft speech. Now that we have the ability with digital hearing aids and cochlear implants to provide that soft speech, provide access to that soft speech we want to make sure that our children are getting that because that is where they're going to get incidental learning and overhearing from and we can do that with both technologies. We also want to find out how they are doing with normal conversation and competing noise because they are sitting in the classroom in a noisy place. So the noise needs to be realistic like for talker babble and we need to make sure that we are assessing at a challenging noise level at least five dBs signal to noise ratio or even at a lower signal to noise ratio at 15 dB or 20 dB signal to noise ratio, it's much too easy. And then we can look at aided thresholds with the right technology and left technology too. This is a chart that I believe is from a study that Jane did where they looked at the average scores, standard scores on different tests for children of different ages and this is great to just have in your clinic so that we can tell parents, when your child scored 68% on this, a normal hearing child would have scored 98% on this test.

- [Jane] Okay, Joan can I just stop for a second and let me give you, give people a little more about this slide. What we did here was we looked at children at normal conversation in quiet, soft conversation in quiet and in three different noise conditions. And even children as young as three the average scores and these are the average scores, were all above 90. And even here, the 95th percentile you can see that the only place where scores were not above 90, was in a very difficult situation which was 30 dB for speech and noise at the same level. So I include this slide just to make sure that people understand that it really is possible to get this information from children and we should just be trying to do it. Okay, I'm giving it back to Joan.

- [Joan] Thank you Jane, I actually learned something there too, thank you. So how do we know if the auditory brain access is sufficient with the technology? Well, speech

perception scores need to be good to excellent. We have a slide coming up, again, of a study that Jane did that will show you where good to excellent falls. And it needs to be good to excellent at normal conversational levels, at soft speech levels, in quiet and in noise. We also if we're going to look at those aided thresholds they need to be in the 20 to 25 dB range throughout the frequency range. We do have to understand that technology is going to interact with aided thresholds when we're using tones or narrowband noise because again, hearing aids and cochlear implants are speech processors. So we could see a feedback circuit decrease the gain, for a high frequency stimulus and we need to be aware of how those interact when we're looking at those, if we're looking at aided thresholds and make sure that we are understanding all of the interactions so we don't over or under amplify.

So here's the study that Jane did. So for typically hearing children, excellent is 90 to 100% and good is 80 to 89%. So our children need to be in that 80 to 100% range. As Jane likes to say this is like a math test, if your grade is not a good grade, 70 is not a good grade on a math test, it is not a good grade on a speech perception test. So it's really important to look realistically about that and when you write your reports to provide a realistic assessment for the parents and the speech pathologists and the teachers who are reading this about how this child's speech perception compares to their normal hearing peers. If the child is not progressing as expected we need as audiologists to suspect the technology first. It's our job to get the information to the auditory brain and that is through the technology we fit. So if we need to ask ourselves, every time a child is not progressing, is that child hearing well enough with the technology? Is that child's brain receiving enough, high fidelity auditory information in order to develop speech and language? Is the child hearing the high frequencies? We know how important that is especially in English. Is the child wearing the technology consistently? Maybe the technology is well fit but the child is not wearing it. Normal hearing people here 24 hours a day. If a child is only using technology four hours a day, it's going to take that child six years to hear what a typically hearing child hears in one year. We need to make sure using our data logging technology which helps us so

much that children are wearing their technology consistently. Does the family have appropriate expectations? Again, are they requiring full time use of technology or do we need to counsel them about that? Are they providing auditory stimulation? Is their home a language rich environment? Do they expect the child to listen and talk? And is everyone else all of the professionals working with the child, do they have appropriate auditory expectations? I'm gonna hand the mic over to Jane for our first case.

- [Jane] Okay, thank you Joan. The first case is a child with a mild hearing loss. Jamie was referred for evaluation by his school because he has been struggling with some aspect of academics in both kindergarten and first grade. Pregnancy and birth and developmental history were uneventful and the parents were not observing any problems with hearing at home. So this was his audiogram and as you can see, Jamie has a mild bilateral, sensorineural hearing loss. The audiologist reported to the parents that testing indicated thresholds at minimal to mild levels with normal hearing functioning and normal middle ear and suggested that they return in one year. So is that good? If anybody wants to type in the question area to talk about this, that would be good. So do you think enough testing has been completed? And is the recommendation to return in one year appropriate? And does the fact that Jamie is having academic problems, affect the recommendation? Should we be making other recommendations? Okay, nobody is typing so I'm gonna have to answer for myself. So I don't think there is enough testing because it's not just thresholds that we need to know about. We also need to know and maybe almost more importantly, we need to know about his speech perception testing, we need to know what his speech perception is in each ear separately and in sound field that normal and soft conversation in quiet which would be 50 and 35 dB and it's at a normal conversation with competing noise at least 50 dB plus five signal to noise ratio. It's really important that we know what the speech perception is especially because there were concerns about problems in school. So and if a child is having problems in school, if we had done more speech perception testing, I think we would know whether or not there was some hearing which might be auditory processing, even if it's not a hearing loss

hearing loss. And so he's having academic problems we really need to do more than, we need to do more than we've done here. Kate is asking, are there key questions to ask about academic struggles? Well, I would want to, I would try to know, it's a good question. I would wanna know what kind of problems is he having? Is he having problems in reading? Is he having problems in language? Does he not seem to follow what's happening in the classroom? Does he seem confused in the classroom setting? So I would ask the parents to please ask the teacher what specific things is bringing concern to her or him and let's see what they have to say about whether what's causing the academic problems. And then once we have that information we're in a better position to provide additional information about what should happen next. But anytime there is concern in a young child, waiting a year is not the right answer. At the very least we have to get this child into some other kind of program that can evaluate him, I might suggest that he have an academic evaluation which the school can provide if there are concerns and at the very least see him for reevaluation in a year. And to answer Kate's question further, one of the questions I would ask is, are there some things about, that he's, what in the classroom is making the teacher, think he's not hearing?

So we did speech perception testing and as you can see he is really not, he's doing, his speech recognition threshold was 30 dB, separate ear information, 84% in one ear, 88% in the other ear that is at 40 dB above speech threshold and those are in the good range. But when we do binaural testing in sound field, he's got 76% at normal conversation, 46% at soft conversation and 54% in competing noise. That is telling me right away that something is wrong in the classroom. If a kid is not hearing soft speech, they're not gonna hear at more than when the speaker is four or five feet away this child is missing a lot of what is said. And in competing noise this child is getting, at soft speech and in noise this child is getting half of what's going on in the classroom. Something is definitely wrong. If thresholds are within normal limits, then maybe this is an auditory processing problem. Let's look at the initial audiogram again. Is that a normal hearing audiogram? No, it's a mild hearing loss and so for what we're seeing

here that's exactly what we would expect. So we need to educate the school staff, about the difficulties that Jamie can be expected to have in learning from soft speech and from competing noise. We have to talk to the family about keeping the home quiet, when he's in a position to learn. We need to monitor middle ear disease to make sure that it doesn't make the mild hearing loss worse. It is essential that this child use a remote microphone, in all academic settings, he's not hearing soft speech, he's not hearing in competing noise, he needs a remote microphone. He also would need a psycho-ed eval to identify areas of difficulties which require management. Okay, Tony asked, lemme just go back here. Tony asked for the reference, for the speech perception standards scores chart. And I don't know if we put it at the end of this talk but if we did not, then I will send it to Christy and she can forward it.

Okay, so let's talk about Matthew. Matthew has a profound hearing loss, pregnancy, birth and developmental history are not significant. He was bilaterally implanted at nine months of age and he is successfully mainstreamed. At the IEP meeting prior to the third grade the school reviewed, the recent test results from the Cochlear Implants Center and decided that Matthew's, they actually said his hearing loss was cured and he no longer had any problems so he didn't need special services at school. So here's Matthew's first speech perception tests, from the Cochlear Implant Center. He was tested with phonetically balanced kindergarten list at normal conversational levels. So are you saying, is this sufficient? Have we done enough speech perception testing here? In my view, the answer to that is no. The PBK is a test designed for kindergarten. The name of the test clearly states that it's a kindergarten level test. You might wanna use it through first grade but you would not wanna use it above first grade. So the test is too easy a test for a child in third grade. It's not testing him at the levels that he needs to be tested. So the first thing we did was retest him and you can see here that when we've tested him with an appropriate test for his academic level which is the CNCs, he's showing scores at 68%, 72%. So this is poor and this one is fair. Fair at normal conversation, good with the FM system. At soft speech and in competing noise he's doing very poorly. So by doing testing that is appropriate we're able to

demonstrate to the school system that he needs help. He needs an FM system, he still needs therapy and so by testing in this way by doing really more thorough speech perception testing, we're really able to provide more information. And this I think is interesting. These are his speech language evaluations and although his overall score was a passing one, if you look at the areas that are circled, I consider these significant areas of weakness. This is a nine year old child and in these areas he is functioning like a seven year old. What does that mean for classroom functioning? When I look at the speech language eval or at the psycho-ed eval I am much less interested, in the total score, than I am in the specific areas of weakness. And if you look at his areas of weakness they're language areas that we would expect a child with a hearing loss who has less access to good information to see. And here are the results with the psycho-ed eval and I've done the same thing, although these scores may be average there areas in which they, I mean in the 39th percentile, the 34th percentile. These are not areas where you want your child functioning, if you're gonna give them the best of everything in school.

So what are we recommending for Matthew? We're recommending that appropriate audiological evaluation, meaning the right speech perception test. Use of an FM in all academic classes with a pass around mic. The teacher of the deaf services to include but not be limited to Preview and Review of academic vocabulary and concepts, Classroom Acoustic Modifications. Our dream is of course drop the ceiling, put a carpet on the floor but we know that doesn't happen all the time. And test accommodations which means extended test time and if there are oral directions for a test they need to be provided to Matthew with the person standing in front of him in a quiet place so we are sure he gets the questions. Before we go to question three, Mamie asked a question about case number one, the child with a mild hearing loss. She's asking, am I saying remote microphone and hearing aids? I would, I personally would fit hearing aids on a child with a 30 decibel hearing loss. That child is missing a great deal. Remember that soft speech which is between 30 and 35 decibels. And as Joan said, 80% of what children learn, they learn by overhearing. A child who's not

hearing soft speech is not going to be able to overhear. So yes, I would say that, for this child I would recommend hearing aids and a remote microphone. Laura wrote that she tells parents that there's a significant difference, among sub-test language scores and his total score. Some comprehensive language testing, includes statistics for the clinician to show the significance of these differences for total scores. And I do, I agree with Laura, you really need to look at the individual scores. Katie is asking if I recommend sentence testing. For example, the AzBio. I like the AzBio, I hate the HINT. I think that we need to do testing, I'm not completely convinced that for young children the AzBio provides as much information as monosyllabic words provides. And let me tell you, when I do monosyllabic word testing, I not only look at whether the word is correct or incorrect but I wanna know what phoneme the kid got wrong. If I said shoe and the child says fu, that's obviously not a real word but it's all I can think of at the moment. Then I know the kid is making an F for SH substitution and that helps and then I can go back and think about what frequencies those phonemes are at and decide whether I need to make some modifications in the technology settings to improve their ability to do that. Sentences we need to remember allow you to use your executive functioning. So if I say I'm going to the library to get some, you don't have to hear the last word to know what I'm gonna do with the library. So sentence, for that reason, sentences are a little less useful I think but the AzBio sentences are in a different category, they're really much better. Okay, I'm turning this over to Joan now.

- [Joan] Thank you Jane. I just want to chime into on the sentences, from Kate's question. With Jane I do not like the HINT sentences at all, I do like the AzBios and I like the pediatric AzBios for our younger kids. And what we use them for not only testing in noise and we have started testing not only plus five with the noise behind them but plus five in the same speaker, when they can do it well behind, we'll do plus five in the same speaker as the stimulus to see how they do in a realistic noise situation where their technology can completely compensate for it with directional microphones. But we also use single word scores and sentence scores to compare. So if we have a child who has a high single word score but a low sentence score, then we know that

child isn't developing language the way we want them to develop language. If we have a low single words score and a high sentence score then we know that child is using their executive function to fill in and does not have good speech perception. And so even though they can get a lot of sentences right we need to go back and look at that technology again.

Alright, so on the case number three. Mr. River did not pass his newborn hearing screening but everything else in his birth and developmental history was typical. Through ABR and the newborn hearing screening process, he was diagnosed with a mild to moderate bilateral sensorineural hearing loss. He went to the ENT for medical clearance for hearing aids and was cleared at three months. The ENT also said that since he had a mild hearing loss, no additional follow other than the hearing aids was needed. So he was stuck with binaural hearing aids at three months of age and the audiologist recommended returning at 12 months of age. So the family returned at 12, 18 and 24 months of age and VRA testing was done. At each of the visits mom expressed concern that language did not appear to be developing. And the audiologist kept responding, well, he won't condition to the VRA so he probably doesn't turn to sound and that's the problem. Until we can get him to turn to sound we're not gonna be able to know what he's hearing. By 24 months of age when they still had no, additional information the center recommended, a sedated ABR for him. So I think we have questions. Are there evident concerns? What could have been done differently? And what should be differently at this point? For the sake of time I'm gonna answer those questions.

Obviously, I think that we even with a mild hearing loss would recommend more follow up to help determine if we know the cause of that hearing loss. And we would also recommend that a child be seen much more regularly than at three months and then 12 months followed by each six months after that. So at this point, we would not recommend a sedated ABR, we would recommend that the parents seek a second opinion and actually the deaf and hard of hearing teacher that worked with this family

suggested that they seek a second opinion and actually told the family that that center they were at did not really specialize in children. And I think as professionals it's important for us to be honest with families. If we don't work a lot with young children, we should tell families that. And if we know a family that's been seen in the center and having difficulty because that center doesn't see young children, often, we need to be upfront and maybe recommend a second opinion. So this mom sought a second opinion and the second opinion center suggested that they start with conditioned play since he had turned two which was a great recommendation and recommended testing every six months one year at a time. So it took a test at two years, two years six months and then three years to get this compilation audiogram which showed now instead of a mild to moderate hearing loss, a moderate to profound hearing loss. Based on those results which took a year to get the center increased the gain on the hearing aids.

And so then we need to ask ourselves, well, what additional information would be in important and what would be the appropriate next steps? Since we're seeing a decrease in hearing, we obviously want this child to go back to the ENT and we would like more information about, why the hearing could be decreasing. The hearing loss getting worse and we really need to start looking into whether our technology, is sufficient for this child and what is the speech and language development at this point? So this mom was really smart and she said, I don't wanna wait six more months to have a test again, I would like my son tested in three months, at three months. Three months later the results were consistent with a compilation audiogram showing a moderate to profound hearing loss and the center provided loaner power hearing aids and at that point they did recommend seeing the ENT who recommended imaging. The family decided to seek a third opinion. So this was when we saw him for the third opinion at three years six months of age. And the bone conduction testings not on here but they were actually able to get bone conduction testing also which confirmed that it was a sensorineural hearing loss. We were also able to get speech perception testing which hadn't been completed at any of the facilities. And you can see that unaided at

105 dB the limits of the audiometer we have very poor speech perception. And with his hearing aids, the loner power hearing aids that he was wearing, he had no access at a normal conversational level with the right hearing aid. And although his SRT was 50 dB with the left hearing aid that did not provide him any open set listening with new . So why were we able to get more information in one setting? I think so much of that if you're going to work with children comes down to your test environment. And this is actually from a psychologist who says a comfortable testing environment, sets the stage for the successful assessment of young children.

So I wanted to give you some tips on some of the things that we use to make testing better. So the first thing is our magic chair and that is the Stokke Tripp Trapp Chair. We have one of these in every single room we are in. This allows young children to be up at the table, up at a high level and strapped in so that they're not sitting on a parent's lap. They're not sitting in a high chair, they have nothing obstructing their view if we're doing VRA. These chairs are worth their weight in gold and even the parents call them the magic chair. We also recently started using this table which is a camping table that has telescoping legs so we can actually raise and lower the height of the table based on the size of the child. So we have a Stokke Tripp Trapp Chair that can hold a six month old who's starting to sit up. We can lower the table so that we can still have toys in front of them. We also have our test assistant so here's our. Come back little, here's our Stokke Tripp Trapp Chair. Here's our telescoping leg table and then we have our test assistant sit, in this small child's chair which places an adult at the eye level of the child. So we get much more information about what's going on with the child. And also when we're doing speech perception actually how are they presenting? And then we have comfortable chairs for the parents which are separate from the child's chair. We do not have the children sitting on the parent's lap, we sometimes have to encourage parents that the child is going to be okay. But that way the parent can't cue the child or let the child out of the test situation. We also have toys and toys and toys and toys. doesn't wanna come back. I can't get my pointer to come back. So there he is. We have buckets of animals, cars, Disney characters, we have the bananas and the

monkeys from AB along with lots and lots and lots of other food we can feed the monkeys. We have DUPLOs, we have pegs, we have many toys. Last week we saw a little boy who would only respond about three times with each toy. But we have so many toys that we could keep changing the toy and keep him on task and get the information that we needed. But you need to also have your toys stored enough out of the child's site so that you can control them. If you're a pediatric audiologist I recommend that you get as many toys as you can. So at this point we now had additional information and we needed to assess it all and make new recommendations. On the way actually to our assessment that day as mom turned off the freeway, she got a call from the radiologist who told her that the imaging indicated bilateral EVA. So after much decision we recommended, simultaneous bilateral implantation, even though this child lived to wear his hearing aids. He was so far behind and both ears needed to be implanted. We also would have understood if the parents, had chosen sequential but these parents decided to do simultaneous. They felt there was no more time to waste. The first six weeks I will tell you, were very, very difficult. They were prepared for the two weeks before activation that he wouldn't hear but they were not prepared for. They didn't realize that it would take time even after the activation.

However, within two months of being activated his language level had returned to where it was pre-implant, he was hearing as well as he was pre-implant. And by six months post-implant, his speech perception was well above, those very, very poor 24% and we were heading up towards getting him into the range that we needed him to hear in. We did HINT sentence testing, he couldn't do a pediatric AzBio but we wanted to see if he was connecting language. And we also were wanting to see that he had access to soft speech. Now we were not satisfied with these scores but we knew we were on the right track. And what we found was that three months post-implant, he had made six months language growth, from the pre-implant levels. By six months he'd made a year language growth and one year post-implant, he had made two years language growth which is what we want to see more than one year's language growth, in one year's time. Julie asked, why didn't we opt for a sedated BAER? Because he

was two years old and he could move on to conditioned play and his parents didn't want to sedate him. They really felt that, they were upset that that had not been, an ABR had not been presented earlier, when it could have been done without sedation. And in California we have some new rules with our sedation too which made it difficult for them at the facility that they were at. They would have had to go to a hospital for it. All right, case number four, who is Connor? So Connor passed his newborn hearing screening which was an ABR. At one year of age his mom took him to the pediatrician and expressed concern about his lack of language development. The pediatrician administered OAEs and out here in California we are seeing a number of pediatricians who have OAEs in their office and administer them. He passed the OAEs so then the pediatrician administered, an autism screening which indicated that the child referred for autism. He was seen by a neurologist who diagnosed him as having Autism Spectrum Disorder with a significant communication disorder.

However, the neurologist told them that he was very unusual for children on the autism spectrum because he had excellent social interaction. And the neurologist actually said, I don't think you're ever going to meet another child on the autism spectrum like yours because he has such amazing social interaction. So he began receiving ABA therapy at a year of age, was enrolled in a class for children with autism at the age of three. He was given an AAC device at the age of three when he entered the autism classroom and he had yearly hearing screenings through the school district nurses. At age five he was using the AAC device to communicate in sentences. He did not use any verbal communication and he did not seem to understand any spoken communication. His teacher administered an autism screening for him as he was transitioning into, they were planning to transition him with an aide into a regular kindergarten class and found no traits of autism. So they had the school nurse, administer another hearing screening. And we had actually gone in and inservice the school nurses and had taught them how to do conditioned play. Before they had been using Music 2 My Ears which we strongly recommended they discontinue using. He referred on the school district assessment and was seen then for a diagnostic

ideological evaluation. The right ear had absent OAEs, the left ear had, present OAE at 6,000 hertz but absent at the other frequencies. And then the ABR had wave five high levels with reversing polarity. Here are the ASSR results and he was diagnosed with Auditory Neuropathy Spectrum Disorder. But what additional information do we need? We don't really have behavioral information with Auditory Neuropathy Spectrum Disorder. With Auditory Neuropathy Spectrum Disorder we want to get that behavioral testing. So we saw him for behavioral testing and this was his behavioral testing using conditioned play. And I don't know that I have the answers but it sure makes you wonder how this normal hearing, obviously it affects, the normal hearing affects the OAEs but you wonder how it would affect the ABR also, since we have that tiny island of normal hearing. So what type of hearing loss do we think this is? Maybe it is Auditory Neuropathy Spectrum Disorder, maybe it is some very unusual hearing loss that gives us strange results. But what are our recommendations for intervention? Regardless of what type of hearing loss it is, this child is actually using. He's using English to communicate with an AAC device and his brain may have actually had some auditory exposure with that normal hearing that little island of normal hearing. So the recommendation has been, bilateral implantation for him and we are working through that process. But as we all know lack of communication does not necessarily indicate autism, it can indicate hearing loss.

And Robin is asking, did we try amplification? Yes, he's actually wearing amplification right now but with that hearing loss it is incredibly difficult to provide the amplification that we need in the low and mid frequencies, we probably need even more amplification in the lows, than this indicates because those low frequency responses, any low frequency tone is gonna pass over that normal hearing in the very high frequencies. So what are the real thresholds? It's hard to know but it's hard to provide the amplification that we need down here in the low frequencies and not provide some type of painful amplification in the high frequencies. So he is wearing hearing aids. He does tolerate them and he is developing some spoken communication but it's going very slowly. And Kate asked about Connor's case. How do we handle excessive ABR

recommendations, from the medical home when a child is otherwise able to perform VRA or learn play audiometry? We strongly believe that we can get the most information, from behavioral testing. So as soon as we can get that behavioral testing, we would much rather see the child, doing the behavioral testing than doing ABRs. ABRs and ASSR are only gonna give us limited information where we can get much more with VRA, well, VRA but especially conditioned play. At this time I'm gonna turn it back over to Jane to get Rosie in here.

- [Jane] I'm gonna do this one in one minute because we have some summary slides that we already wanna do and we have only two minutes left. So I'm gonna do this one quickly. This is a child who has, was born with CMV, has a significant visual impairment and a moderate hearing loss. She received hearing aids at three months and the parents were in a State School for the Deaf and they were told to do ASL and they're supposedly doing spoken language also, the parents were concerned that at the dinner table Rosie could not follow what was going on because there was so much confusion. And the school recommended that somebody be seated within a foot of Rosie to sign to her so that she could understand what was happening at the dinner table. So is that really a good idea? And for me, this is a child with a vision loss and a hearing loss. We know from CMV that this child's vision may get worse and so this is a child who's got enough hearing to learn to use audition. So for a child like this, I think we really should be building the auditory skills and that's what I tried to tell mom. Okay, Christy is saying we can go over a couple of minutes. Good, so I mean, I think this is really, a critical situation. Where this family lives the only services were provided is School for the Deaf and so that's where they went for services and the School for the Deaf was recommending, sign language services. My prejudice and Joan's prejudice is that whenever possible we want to provide children the opportunity to have the best possible opportunities to develop skills so that they can communicate with people around them. And so that they have the opportunities for work and for life. We know that people who do not have, I mean, there was a research study, in the "Wall Street Journal" a few years back which showed that, was about people who come into this

country and do not learn to speak English. It was not about people with hearing loss but what the study showed was that people who did not have good English skills, had significant poor income over their lifetime, significantly less income. And so it's the same thing that's part of my view about providing language to children so that they are able to use speech and language and to be whatever they want to be. If a child needs a sign language interpreter in order to work, their work situation is going to be limited. So, what I told this family I sort of bite it in because I was a speaker at a workshop in this School for the Deaf. And I said to the parent after I heard the story that I really thought that this was a child who had usable hearing and we ought to be teaching this child to listen.

So the key points that we're trying that we hope we made today. That we want to be absolutely certain that children are receiving enough auditory information, for the auditory brain development and for the development of language and literacy. That means they need to be hearing not in the middle of the speech banana because then they're not even hearing soft speech. Certainly not in the bottom of the speech banana but at the top of the speech banana in what I like to call the speech string bean. That's where kids need to be hearing if they're gonna be hearing well enough. We need to be specific in knowing what the child hears. They need aided threshold at a sufficiently soft level which is 20 to 25 dB, not zero. They need to be hearing well in both ears, using both neural tracts. Speech perception needs to be conducted at normal conversation which is 50 decibels, soft conversation 30 to 35 and in competing noise so we know exactly how a child is hearing and so we can tell the school what needs to happen. We need to be absolutely certain that families understand what is necessary for a child with a hearing loss to succeed. And they need to understand that that means they need to hear well with their technology that they need to wear their technology 10 or more hours a day and that they need to be using listening and spoken language to develop those skills. And to be sure that academically they are doing, they are learning what is going on in the classroom and not being shifted to the back where they're doing okay for a deaf child. The audiologists have a responsibility.

We have to monitor not just the technology but we need to ask what's happening in school. We need to ask what kind of therapy is happening and since most kids once they get to school are getting their therapy in school, I always ask the parents what kind of, what's happening in speech therapy? And if the parent doesn't know that's not a good sign. The parent needs to know, the parent needs to be involved. The parent needs to know what the speech language scores are and we as audiologists need to know. We need to ask to have all the test results so that we can look at them and help the parents understand them, if somebody else isn't doing that. We are responsible for monitoring the whole child, not just their ears. It's a lot of work, I know it's a lot of work but it's also what makes the job exciting. We can never assume, everything needs to be tested. If we don't have the test results, we don't know what the answer is. Okay, I'm turning.

- [Joan] All right, so as audiologists, we all are responsible for making sure that that auditory information gets to every child's brain because no one else on the team can do their job, until we have done our job. The parents can't input language, the speech and language specialist can't do it, the speech pathologist, the teachers of the deaf, no one can do their job until we make sure that we have optimal auditory information going to that child's brain. And unfortunately not audiologist have, an auditory verbal approach when fitting technology, not all audiologists understand how important it is not just for the child to see things but for the child to actually get information, from their technology into their ears and up to their brain. And we would hope that parents would be encouraged to seek out those audiologists who know about auditory brain development in children. And many audiologists roles rely on their hearing aid or their cochlear implant programming strategies to program the technology. Again, real ear, eSRT, neural responses, they are great information for programming but we still need to know what is going to the auditory brain. So it's our responsibility to ensure that that information is getting to the brain and we do that through aided testing, making sure that the child has optimal aided performance and good to excellent speech perception. And that they are receiving enough information to plan the intervention. We want to do

that, we don't want. We want to be involved in planning that intervention. We don't want it to be the responsibility of the family, the SLPs and the LSLs to come back to us to tell us that things are not going well. We want to be intimately involved in making sure that there's good auditory brain access. So to do that we have to work collaboratively with other professionals and we need to provide them with the evidence through testing of good auditory brain access and technology functions so that children can develop language and literacy. Thank you so much for listening today.

- [Jane] Joan, one thing here. Lemme, I'd like to add one thing. When we look at speech perception testing, the real I mean, the way we score speech perception testing by the way, the reference is at the bottom of the screen here now for the speech perception testing. If we don't, if we're not honest about the way we describe, the test results, excellent, good, fair or poor, we're not being fair to the child. If a child's got speech perception at 68% and I say this is good speech perception. The message I'm giving to the parents and the therapists and the schools is that he's doing great and there's nothing, we don't need to do anything about it. No work needs to be done. And that's not the wrong message, that's not the right message. We're not being fair to the family if we're not right, about the way we describe testing. So please just, I know, nobody wants to write speech perception is poor, I really understand that but I think we really have to do it. Thank you so much for participating in this program. I'm sorry that we ran over but we just had too much to say. Have a good day.

- [Joan] Thank you so much.