Unilater Hearing Loss Transcript

05/27/15 12:08:31 PM

>> Good morning, everyone.
I hope you all can hear me well.
This is our Webinar for the CAEDHH professionals.
This hearing is being captioned, and I hope my voice is coming through relatively clear, and wherever you are, you have a good internet connection.
I am getting lots of feedback that everyone is hearing me well, and I would also like to say hello and she will go doing our captioning today am I'm Dave Gordey and I am working for Oticon in Denmark.
And, of course, I know many of you previously from my work as an audiologist working in Victoria and Vancouver.
and then as the pediatric program manager for Canada.
and so today, we are going to talk about the management of children with Unilateral Hearing Loss, and I would like to say thank you to everybody who is able to make it back today.
Unfortunately, we did have to cancel the other session as I had an allergic reaction, and ended up in the emergency room having multiple tests, and thankfully, they took good care of me, and I am feeling much better.
for those of you that would like copies of today's presentation, I have sent copies of the slides to Micah, and she is more than happy to distribute those slides to you.
For those of you that are not familiar with the Webinar format, there is an icon with a little outline of a little man with his hand raised, and that is where you will be able to ask questions.
And from a flow perspective, I would suggest that we just leave the questions until the end of the presentation.
We have covered that.
So the world has changed significantly for children with hearing loss.
And there is a few reasons for that.
First, we have newborn hearing screening where children are identified early, receive appropriate intervention, and hearing technology.
All of which helps them achieve communication outcomes similar to their hearing peers.
The second thing that has really changed for children with hearing loss is innovations in hearing technology.
Now that we have better hearing technology, which includes hearing AIDS, coke Cochlear Implants, bone conduction devices, children are given a better auditory signal which leads to the develop of age appropriate spoken language.
the other thing that we have seen is a shift in education choices.
Likely, the result of the two previous points that I just made.
Brown, in 2006, did a study and noted that in 1995, 60% of children who had a severe hearing loss chose sign language as their primary mode of communication, where 40% chose spoken language.
This was a big, a big shift was noted in 2005 where 85% were choosing spoken language, and 15% were choosing sign language.
Most hearing care professionals work within a model of evidence-based practice where protocols are used to provide optimal and consistent services to children with hearing loss.
As the graph illustrates, professional expertise, client needs, and best available clinical and research evidence collaborate to help us to deliver gold standard services for children with bilateral hearing loss.

Sarah McKay from the children's hospital of Philadelphia once called children with Unilateral Hearing Loss the forgotten ones.
And I think that this is because children with Unilateral Hearing Loss often commands less attention, awareness, and advocacy of the needs of children with bilateral hearing loss.
We know that there are fewer workshops or mentoring activities designed for their needs.
They are also less likely to undergo a medical or radiological work-up for the cause of the hearing loss.
They are less likely to know peers like them.
So, as a starting point, let's consider how we define Unilateral Hearing Loss.
It is defined as a hearing loss that affects only one ear.
It can be mild to profound, and can be conductive, mixed, or sensorineural in nature.
It is typically characterized by difficulty locating the source of sounds, understanding speech in a noisy background, and having difficulty in word understanding from the poor ear, and this is something that varies from individual to individual.
Unilateral Hearing Loss in children may be identified late, if it was not present during infant hearing screening, and this is because most of the time children who have typical hearing in their unaffected ear can function relatively well where they may go unnoticed.
We also know that children with mild hearing loss was significantly more likely to get amplification than those with Unilateral Hearing Loss.
I guess the most troubling thing that we face with hearing care professionals is the most frequent recommendation made when Unilateral Hearing Loss has been identified was merely to give advice, give preferential seating instructions for the classroom, and put them on review to monitor the hearing in their bad ear.
While this is problematic, even more problematic are the challenges that face hearing care professionals.
First, there is little consensus among hearing professionals and physicians on the management of children with Unilateral Hearing Loss.
This means that convincing parents about the benefits of early amplification can be difficult.
There also is a limited body of research on aiding young children with Unilateral Hearing Loss.
I am optimistic that with the onset of newborn hearing screening programs throughout North America, that there will be more researcher who will take on this challenge upon investigating this outcome.
So, when we consider incidents, McKay and Iyer placed it at one in 3,700 newborns.
Incidence does increase with age due to noise exposure, sudden sensorineural hearing loss, trauma, and the use of ototoxic drugs to cure severe and significant childhood diseases.
There also seems to be an equal split between the right versus left ear.
When we consider the causes of Unilateral Hearing Loss, nance in 2007 came up with an updated list.
First what is congenital where the hearing loss is present at birth.
Second, was due to some sort of trauma at birth.
And third, there are illnesses like meningitis, mumps, head trauma, and chronic ear infections that can cause acquired Unilateral Hearing Loss.
if we can pause the presentation for a moment.
If there is anyone that has their microphone active on their laptop, perhaps you could try muting that,

and that might improve the sound quality for others.
We do have a few people commenting that there is a bit of feedback I am going to try and adjust my settings quickly here and see if I can just my microphone volume.
>> I am going to ask Christa, is that better?
So way to go, Dave, for throwing the blame out to you.
I had my microphone up fairly high.
Sorry about that.
>> Hopefully, that is better for everyone.
Is that better for you?
Those of you that are finding it might be too quiet, you may adjust the volume on your own laptop.
Ok.
So the overall consensus is that it is much better.
Good.
So, we'll continue.
Thank you for noting that and helping us get an optimal volume.
When we consider the progression for Unilateral Hearing Loss to bilateral hearing loss, Sarah McKay from the children's hospital of Philadelphia identified a high risk group that we need to be aware of.
And those are children that have a family history of progressive sensorineural hearing loss.
Those individuals that have enlarged vestibular aqueduct, as has been identified through a C.T. scan, and then of most concern to us is those children who have unilateral hearing loss due to Cytomegalovirus.
Now, we know that many children with Unilateral Hearing Loss are simply put on a review protocol where they may not have the same type of medical work-up as a child that is identified with bilateral sensorineural hearing loss.
And as robson found, this is problematic.
They did a briefcase history review of 18 children who are identified with Unilateral Hearing Loss, and all those children underwent a C.T. scan.
and what was surprising to them was eight of those children, almost half, had abnormal findings that included the identification of enlarged vestibular aqueduct, a Mondini deformity, Cochlear hypoplasia.
and abnormal semi-circular canals.
So, had those children not had those scans, they would have gone unnoticed and certainly, all of these individuals are at a higher risk for this loss getting progressive, and in some cases, progressive to the unaffected ear.
Ok.
So, let's consider the difference between when the right ear versus the left ear is affected.
We're going to dig back into our brains here of our Cochlear anatomy.
And you will remember that the right ear pathway is directed to the left ear, the left hemisphere, and the left ear pathway is directed to the right hemisphere, and this is important as we consider how our right ear unilateral loss may differ from a left ear.
Niedzielski and colleagues in 2006 completed a study where they evaluated 64 children with Unilateral Hearing Loss.
The average age of the children was 11 years old.
And all of the children were given standardized intelligence tests.

What they noted was that children with right side hearing loss scored much lower on the verbal test compared to those with left-sided unilateral loss.
They also noted that children with right-side hearing loss had a reduced number of concepts, lower skills for learning verbal material, and smaller abilities to use acquired knowledge in every day situations.
For those children that had a left-sided Unilateral Hearing Loss, they scored more poorly on non verbal tests.
They demonstrated reduced abilities for analyzing synthesizing, visual memory, spatial imagination and motor coordination.
the impact of the Unilateral Hearing Loss reaches well beyond loss of addability in the affected ear.
We know that the impact and touch and speech and language development, cognitive abilities, self-esteem, and social capabilities, and that's why it's so important that we take or consider these children with Unilateral Hearing Loss very seriously.
the first challenge, children with Unilateral Hearing Loss face is difficulty with reduced signal to noise ratio.
We know that children with typical hearing require a greater signal to noise ratio than adults to discriminate, to discriminate speech.
This is because the auditory cortex is not fully developed, and adults have a better language.
As Ruscetta and colleagues noted in 2005, children with unilateral hearing loss require a greater signal to noise ratio than children with typical hearing.
They suggested that we consider the following listening environments and the signal to noise ratios that are present there.
Those environments are the child's classroom, the environments at recess, and social activities that the child may find themselves in outside of school, like restaurants, sports activities, or birthday parties.
Tharpe from Vanderbilt University has also done some investigation into children with unilateral loss, specifically looking at their academic, social, and behavioral outcomes.
She noted that 22 to 35% of the unilateral and mile losses are failing one grade in school.
12-41% of the children are also receiving an educational assistance.
She theorized that the reason for these failures and need for educational assistance could be related to decreased energy.
She suggested that children with hearing loss, Unilateral Hearing Loss need to exert more listening energy and may have a slower processing time than their hearing peers.
There also may be other factors to consider related to the etiology of the loss.
For example, there may be a neurological deficit related to the Cytomegalovirus virus.
There may be poor school performance due to low self-esteem and high stress.
She also noted that these children were less likely to qualify for services at school.
When considering speech and language development, Tharpe suggested that 33% of preschool aged children had Mean Length Utterance below age expectations.
Further examination of the literature suggests that 25% of these children have some sort of language delay.
It made me consider when children are identified with unilateral losses, are we reteenly recognizing a speech and language assessment, and are we continuing to monitor their speech and language

development prior to school entry.
In 1998, bess and colleagues looked at unilateral loss and reviewed the records of over 1,000 children in grades three, six, and nine.
of these children, 5.4% had a minimal hearing loss.
30% of the third graders with minimal loss had repeated a grade.
And by ninth grade, 50% had repeated a grade.
Indicating that the impact of this hearing loss was quite significant.
Borton Mauze and Lieu in 2010 looked at the psycheosocial impact of Unilateral Hearing Loss.
They looked at children from 6-17 years, and administered a health related quality of life survey, within the survey, they had a control group of normal heart-breaker individuals and those with bilateral loss.
And they had a focus group for those with unilateral loss.
But, what they found was that the children with unilateral hearing loss had significantly more variance in the social functioning score than children with normal hearing or those with bilateral hearing loss.
Both parents and children with unilateral hearing loss rated social functioning lower than children with normal hearing or bilateral hearing loss.
the focus groups found that children themselves didn't notice difference as much as their parents did.
Parents suggested that difficulties got worse as their children aged and got into sports, and other social activities.
Parents also commented in the study that they felt that the teachers were not educated about Unilateral Hearing Loss, and as a result, their children suffered.
They also noted in the study that the use of assistive technology was seen as a barrier by the students as being -- as seeing themselves as normal.
So now, let's consider some solutions for children with hearing loss.
We had a number of options that we can consider when looking at children with Unilateral Hearing Loss.
And those options are behind the ear hearing AIDS, the use of the F.M. systems, CROS hearing aids.
Bone conduction hearing AIDS, and yes, they are now actually considering the use of Cochlear Implants.
We'll talk about that in a moment.
One of the nice things that we have seen recently is an updated guideline for the management of children with unilateral hearing loss.
And this update happened within the American academy of audiology pediatric amplification guidelines in 2013.
We also saw an updated occur in the on tairg hearing program in 2014 to also include more attention for children with Unilateral Hearing Loss.
in the guidelines, the evidence-based statement said recently the American academy of audiology has updated their pediatric amplification clinical practice guidelines and indicated that children with aidable unilateral hearing loss should be considered candidates for amplification.
in 2009, the individuals from the Cincinnati children's hospital published this flow chart, or tree on how we might manage children with hearing loss, and what I will do is I will also forward the original copy of this document to Maaike that she can share with you.
I realize now that the quality of this image is not the best.

But, essentially, as you can see, is they give guidance to hearing care professionals on what type of amplification intervention should be considered when working with children.
If you look to the left, you can see if you are identified with a severe to profound hearing loss, in the affected hear, the hearing aid fitting is not considered.
Whereas if you are identified with a mild to moderately severe hearing loss as shown on the right side of the graph, a hearing aid trial is your first line of intervention.
What I really like about this decision tree is it gives us a very clear guideline about how we should proceed in managing these children.
So, let's look at that a little further.
So, when considering a hearing aid fitting, in the affected ear, the degree of hearing loss should be typically from mild to moderately severe.
There also should be fair to discriminatory hearing in the affected ear, and that the child and parents are motivated to use amplification.
What the literature suggests is that an earlier fitting seems to translate into better fitting.
Not only in terms of better acceptance from the child, but also, better outcomes in terms of the effectiveness of the amplification.
Again, going back to the work of Sarah McKay from the children's hospital in Philadelphia, she noted that the benefits of early amplification and early intervention should have, should happen before six months of age, and that we need to make sure when we are considering children with Unilateral Hearing Loss, for a hearing aid, that we have a clear understanding of the type of hearing loss that we are working with.
Whether it be mixed conductive or sensorineural.
She also noted that by introducing hearing aids earlier, the affected deprivation may be minimized.
And this can also be important should the hearing loss turn out to be progressive.
They also noted that when children are fitted at a young age it becomes integrated and part of their identity, and they seem to have less social and emotional issues associated with that fitting.
So, considerations when selecting a device for a child.
Certainly we want to select a device that is pediatric-specific.
In other words, the hearing aid has a battery door, personal F.M. capability, perhaps it has some water resistance features.
It has a lockable volume control a pediatric ear hook -- all the things that are really important for young children.
It's also important when doing the fitting of the device that we use prescriptive formulas and age-generated targets to help us guide us in setting the gain and output of the hearing device.
Next it's important to us outcome measures like speech testing, comparing the benefits of aided versus unaided.
So we want to make sure that when we are fitting a device to a child with a unilateral loss, that it is not detrimental to their speech understanding in their good ear.
It can also be useful for us to use outcome questionnaires, like the child, the PEACH, the ELF, all the questionnaire that is assist us in gathering good information from the parents, from the child themselves, and from classroom teachers.
They recommended follow-up for these children, when they are preschool age, they should be seen at minimum every six months, and then once they reach school age, they be seen annually for

audiological review.
So Sarah McKay in 2002 did a study looking at does a hearing aid improve the quality of life with children with Unilateral Hearing Loss?
In her study she looked at 28 children that were fit with hearing AIDS ages 2-17 years of age.
The Unilateral Hearing Loss ranged from mild to moderately severe.
She asked their parents to report on the child's attention span, their ability to follow direction, their frustration level since being fit with the hearing aid.
The child's ability to understand TV and conversations with the hearing aid.
Looking at the responsiveness from called from another room.
Looking at the ability to hearing group situations, and in the car.
Looking at the child's confidence and how the child likes the hearing aid, and the type of discussion that occurred when deciding to get the hearing aid.
So from the survey results the majority of the parents commented that the child was doing the same or improved or greatly improved in all areas with the hearing aid.
So, it's important that everyone felt that everyone thought their child was doing worse.
The majority of the kids commented they liked the hearing aid but some commented that they didn't like the way it looked.
but, many of them continued to wear it even though they did not like it because they recognized the benefit they received from it.
Other studies have suggested that there is a low compliance among children who are identified late, which translates into a later hearing aid fitting.
This may be due to cosmetics or to the auditory pathways becoming, as I like to say, becoming clogged or, perhaps, some sort of auditory reorganization has already taken place in the brain giving preference to the better ear.
I have a lot of personal experience clinically with this with children who at age 12 or 13 who have a congenital Unilateral Hearing Loss decided to try a hearing aid, and most of those children reported that the sound quality was very poor.
This is compared to children who were fferred at age three or four and were fit with hearing devices.
Many of those children had a very different outcome, like they do to the brain's proximity and better able to manage that auditory signal.
When we consider those children with severe hearing loss, in the affected ear or those children that are being fit with hearing loss, it can be an option for them.
As we know FM, personal FM systems help enhance the signal to noise ratio, bringing the speaker's voice directly to the listener's ear.
The selection of -- or the selection of using personal FM or a sound field FM system is going to be base the on the individual profile of the child, and the age of the child.
So, in other words, there is no global recognition on whether one is going to be better than the other.
It really depends on the individual.
From an audiological perspective, of course, personal FM is always our first choice because our signal to noise ratio is going to be much better, as well as if we have the teacher wearing a boom microphone, that deliver -- the delivery of high frequency consonant sounds that are very important for past tense, plural, are going to be delivered in a much more audible fashion than if it were delivered through sound field speakers.

Ok.
That being said, it is important to consider the profile of the child and whether they will, in fact, use the personal FM or if they have some additional disability or limitation that might prohibit or limit them from wearing personal systems.
But, from an audiological perspective, the personal FM is the first starting point.
Next is to consider is the use of a CROS hearing aid.
For those that are not familiar with the CROS hearing aid, basically, the individual is wearing a microphone, which looks like a hearing aid on their affected ear.
The sound is then picked up by that microphone and delivered to a hearing aid that is worn on their good or typical hearing ear.
It does get the person the perception that they are hearing on their affected side.
The challenge that we have seen in the past with these devices is that because the individual has good hearing in one ear, they really are not receptive are wearing a device on that side, so we do find that while initially, there is a sunshine effect of liking the feeling that they are able to localize or find where sound is coming from, but over time, they seem to resistor [Inaudible] wearing two
devices at the same time, but another option for us to consider.
Most recently, there has been -- there have been individuals who have been using bone-anchored hearing devices as a way to deliver sound to the better hearing Cochleas, so these devices often are called BAHAs.
The new term used is bone-anchored hearing aid systems.
It works on the principle that you are hearing the bone conduction device on an abutment or on a headband.
On your affected ear, on the side with the Unilateral Hearing Loss.
And that's through skull vibration, sound is being sent over to your better ear.
It also gives the person the perception that they are able to localize sound from that side, but again, it is -- it is really, using this type of device really depends on the motivation of the individual.
So, for children, we talked about these devices being worn with those individuals who may have unilateral Atresia.
And so they will wear that on the affected ear.
We also have seen it worn on some children who have had sudden hearing loss, that has been due to some sort of illness or head trauma, and again, this is being worn on a soft band or a headband.
We see in Canada, at least, that surgeons are very cautious about doing the surgery and placing an implant and abutment on that affected ear.
And that is because of limited funding, and also, data that suggests that many of these children who have received bone-anchored hearing implants discontinue wearing their device when they get to the age, around age 13 or 14.
And so at least in Canada, the hospitals are making decisions about the best way to utilize their resources and typically, it does not include children with a Unilateral Hearing Loss or what they call deafness.
Children on the soft band, it is something that can be, again, an alternative for them to try.
So, recently, there have been a growing number of studies exploring and evaluating the effect of Cochlear implantation for rehabilitation of those individuals that have Unilateral Hearing Loss or as they also call it single-sided deafness.

Most studies to date have been adults or children with acquired hearing loss.
So these are children that, for whatever reason, children and adults who had auditory systems and auditory pathways that were well developed, and through some sort of trauma or event, they lost their hearing in that ear.
Most of these individuals who received a Cochlear implant noted improvements in sound localization, speech understanding and quieted noise, and for adults, particularly, those who had acoustic aromas on that side, they noticed a reduction in tinnitus.
In many of the cases, the results that were recorded in adults with Cochlear Implants, were far superior than the results that were achieved with their experiences wearing a bone-anchored device or a CROS hearing aid.
Now, currently, there is no approval for these Cochlear Implants, treating Unilateral Hearing Loss by health Canada or the Food and Drug Administration in the United States, so all this evidence that is being delivered or presented has really been done as individuals who agreed to be part of clinical trials and research studies.
This was the main focus in December of this past year at the pediatric Cochlear implant conference in Nashville.
the presenters were focusing on investigating the utility of using Cochlear Implants for Unilateral Hearing Loss, particularly for those children who did not respond well with amplification.
So in this case, we would be speaking about those individuals who had severe to profound hearing loss with unaidable hearing in their affected ear.
Certainly the studies that were presented at this conference, the adult ones, far outnumbered those children, and that certainly goes around, I am sure, to considerations and consent to participate in these studies.
There were some suggestions, and recommendations made to consider implanting children with single-sided as soon as possible as it would benefit their speech and language development, reduce education delays, auditory fatigue and educational disability, and that was presented and now published in the journal titled "outcomes of children and adolescents with unilateral hearing loss," by Giardina in 2014.
And I will also provide Maaike with a copy of this article.
So next up, what's really important when we're considering interventions with children with Unilateral Hearing Loss is really getting a good assessment of their functional auditory abilities.
And as I mentioned earlier, there are some good tools out there.
I am sure that each of you have your own that are your favorites.
To help us to functionally assess listening behaviors in different environments.
So, Karen [Inaudible], the child is good, there is also the life revised, the SIFTER has been good for use in the classroom.
The PEACH is a good tool with good normative data to help us understand parent observations.
All of these can be used to help the hearing professional gather information and develop management plans for children with Unilateral Hearing Loss.
the other thing for us to consider is how the children, how these children are being, considerations for them in the home and the classroom, and really, what I'm speaking about is things along the lines of safety.
Our children being thought to use visual cues, to protect themselves in hazardous situations?

Where localization is very, very important.
For example, crossing a busy street and knowing when traffic is approaching you from one side versus the other.
We also want to make sure that we counsel them on protecting their good oh, and use earplugs and the detrimental effects of loud noise and music.
We also want to help them find a spot in their classroom where they are best able to hear their teacher as well as their classmates and have good access to the visual cues.
I think that 20 years ago, it was always the front of the class, and now we know that typically it tends to be more like the middle of the classroom where they are going to have the best access to both audio and visual information.
Ok.
So for summarize what we have talked about today, first children with Unilateral Hearing Loss should have the same medical evaluation and speech and language assessment as those with bilateral hearing loss.
They need close monitoring of the better ear to ensure that there is no progression.
We need to make sure that we are prepared to communicate and counsel parents and other professionals on the impact of Unilateral Hearing Loss and the significant effect it can have on children's development.
Children who meet candidacy criteria can benefit from a trial with amplification, and early intervention seems to be the key.
Hearing care professionals may consider beginning with the least invasive solutions to understand potential benefit and possibly understand the families and the child's motivation to use that device.
And FM seems to benefit children with Unilateral Hearing Loss and manages barriers to good listening by reducing auditory fatigue.
It is crucial to remember the different benefits associated between personal and sound field amplification systems, that personal systems do provide a better signal to noise ratio, and recognizing that in all cases, there are some limitations where some children may have to opt and use classroom amplification.
It's also important for us to remember that technology alone did not eliminate academic challenges, particularly, those children who are -- were provided with late intervention.
Social skills, psychological impacts, all those things need to be addressed.
And understood for each of the individual children.
We also know that children with Unilateral Hearing Loss can benefit from the same types of mentoring and peer connections that we provide to those children with bilateral hearing loss.
That the same feelings of isolation and identity do occur with children with Unilateral Hearing Loss.
So, we should try and include children with Unilateral Hearing Loss with one another.
And most important we want to remember that every child deserves the best, so all of these interventions, all these tools that we have talked about really can help children achieve their full potential.
This is my information.
Should you want to reach out and ask any questions, if we don't have time today or if you would like any more information about the presentation, I also wanted to provide you with a list of references and acknowledgments of where all of this information came from.

Today I am a knowledge broker, in the words of my friend, Sarah burns, and I am merely just presenting this summary of what is currently out there in the literature, and peer-reviewed evidence.
Ok.
So, we do have some time now for questions, and so if you do have a question, please go ahead and type your question, and I will read the question and answer it as best as I can.
So, the question is why is it recommended not to aid a Unilateral Hearing Loss with a severe to profound loss?
Great question, Karin.
It really comes down to being able to meet the target of Audaability with that, if someone has a severe to profound hearing loss even with the most powerful, behind the ear hearing aid, it will be difficult for us to meet the target of our amplification to have good speech understanding in that ear.
We also note that frequently in those individuals with severe to profound hearing loss in one ear, that they have very poor word understanding, and so that even if we might get their Audability into conversational speech, it may be so distorted that it is not of benefit, so that is typically why, for severe to profound hearing loss, we are generally recommending that they are using some other device, but again, that would be a part of your assessment.
Ok.
ok.
You had a question about the effects of minimal hearing loss.
In regards to Unilateral Hearing Loss.
It's interesting because particularly anna marie Tharpe looks at these two groups together, and she blends most of the results together, and I think the reason why she is looking at these two groups together is because children with minimal hearing loss often have the same outcome or reaction by hearing professionals as those with Unilateral Hearing Loss, which they are not typically provided any intervention.
They are mainly put on review, and put on a monitor strategy, and so sometimes we will see minimal loss and unilateral loss grouped together.
So hopefully, that answers your question.
Next question is, is there any research at the use of sound field, with young students with Unilateral Hearing Loss, and moving to personal FM when they hit high school?
You know, what's interesting is that there has been a real slump in researcher evaluating sound field or classroom amplification systems and it's effect or benefit on children with different types of hearing loss.
So, there is not any literature that I am aware of.
There is more just general information that talks about how classroom amplification does lower the noise floor in the classroom, and by the teacher using the microphone, does improve the signal to noise ratio, which benefits all students including those students that have special listening needs.
So, I would expect with your question relating to transitioning to personal FM, that I will expect there would be certainly more resistance on using personal FM when they hit high school just from the cosmetic standpoint, but that's going to depend on the individuals and I can imagine that if an individual is struggling significantly, they need to be more receptive to using an ear level FM system if they are noticing benefit.
So, another great question is considering the ethical consideration in the allocation of Cochlear

Implant resource, how readily will Cochlear Implant -- sorry, I just lost that for a second.
How readily available will Cochlear Implant sites be ready to accept the use of Cochlear Implants for Unilateral Hearing Loss.
I think that this is a great question, and definitely the vibe or feeling at the pediatric conference in national was who is going to pay for all this.
We barely have enough money to fit children with bilateral hearing loss, and so it depends on where you live.
There are some countries, particularly, European countries where Cochlear Implants are much better, and this is -- so for Germany would be a great example for that where they have very, very big funding for Cochlear Implants, and seem to be willing to take on this type of an intervention, but I would say at least in the United States and Canada, where resources are tight, it would be a very, very
long time for this to become accepted by health Canada and by the fda.
Right now, it is really only in a test phase, and being only considered as a research study for those individuals.
Sorry for the pause here, I am just scrolling down through the questions here.
So another question is, regarding a comment that I made about the sunshine effect with CROS fittings.
And this particular individual is noticing that there is a good success rate with pediatric CROS fittings, and I would say the point you made there is that these are pediatric cross fittings and the sunshine effect that I noted was, or that has been noted has been children that have been fit with CROS devices when they are 11 or 12, mid teens, so, you know, again, the adaptability or the ability
to sort of integrate it into themselves needs to be a bit more challenging than when they are younger.
Ok.
So there is a question about using sound field, aided sound field test measurements as part of the verification or assessment process to determine the device benefit.
And I should clarify that what I meant by aided sound field testing was really doing aided speech testing.
So, we are not talking about using aided audiograms, but rather, we are talking about doing aided sound field testing in speech and in quiet.
So I should clarify that.
When we talked about sound field testing, we were talking about the use of speech materials.
Next question, what age would you recommend an ear level FM system for a student with a Unilateral Hearing Loss.
You know, again, if we consider the guidelines from Cincinnati children's hospital, and if they meet the criteria of having a child with a personal FM system, I would say that the intervention should, or should occur, certainly, at a relatively young age where you feel that the child could complete some sort of measurement in the sound booth to give us some idea of the audability with
that device.
How they are doing and that it's not affecting the understanding in their other ear poorly, so I would say that we would be looking at roughly, depending on the child, age three or four.
Ok, I am scrolling through here and I think that we have all the questions.
If I did not answer your question, if you could press the little raise the hand thing there on the top of

your screen, and type it in there, that will help me find your question if I did not answer it because there was a few people typing at the same time.
And I am scrolling through here -- I don't see any more but if you can raise your hand on the screen at the top, and type your question in there, that would be super, and we do have about another five minutes for questions.
Thank you, Jacques.
And so, aside from the research, you stated -- oops.
You shared about left and right-sided hearing loss, and any -- is there any further research that we should be concerned about with, with the right sided deafness and the impact?
I think that the research that I find most interesting when it comes to Unilateral Hearing Loss is the research that has been completed -- it's right here, I am just looking for the reference.
There's a fellow that is looking at add to your reorganization, and trying to understand what happens in the brain with Unilateral Hearing Loss when no intervention is provided.
And what's really compelling about that is basically, he's done a lot of brain scans, this particular researcher, and found that, that if there is no input to the affected ear, that the brain, the