This morning's presentation

9:00 – 9:55 What we know about unilateral hearing loss, including amplification options

10:00 – 10:55 How we can share what we know with families

11:00 – 12:00 What we know about permanent and fluctuating mild hearing loss

Objectives

- Discuss what we know about children with unilateral hearing loss (UHL): prevalence, listening problems, amplification choices, and issues
- Examine what we know about children with mild hearing loss: prevalence, listening problems, amplification choices, and issues
- Explore resources for working with families of children with UHL and mild hearing losses: key points to aid in decision-making

PART 1: What we know about unilateral hearing loss (UHL), including amplification options

Relative Prevalence - 1 of every 5 newborns identified with hearing loss have unilateral loss

2 Types of Unilateral Hearing Loss: Permanent due to malformations of the outer or middle ear and permanent due to imperfections in the development of the hearing nerve

Malformations to outer/middle ear:

- Congenital microtia/aural atresia is rare with an incidence of 1:10,000 births
- More than 75% of these cases are unilateral, resulting in maximum bilateral conductive hearing loss (around 60 dB HL) in one ear. PA: about 145,500 birthrate in 2009 so we can estimate 14 cases of atresia, 10 of which are unilateral. Teen birth rate in PA is 7% in non-Hispanic and 17% in Hispanic so 1-2 of these can be expected to be the child of a teen mother.

Microtia = "small ear" – It comes in different grades in terms of how much the outer ear is underdeveloped. Microtia is usually accompanied by aural atresia or ear canal stenosis. A narrowed ear canal is called a stenotic canal (ear canal stenosis), which *may* not affect hearing.

Atresia - Aural atresia refers to the absence an external ear canal – always results in hearing loss. Often also malformation of the external ear and middle ear, but the inner ear and auditory nerve are frequently normal. In approximately 25% of cases, the "normal" ear in patients who have <u>one-sided</u> may also have a hearing loss on their normal appearing ear.

Accompanying aural atresia: Approximately 12% have a heart deformation. Approximately 8% have a kidney deformation. Atresia and microtia may be associated with syndromes such as: Treacher Collins, Crouzon's, Apert's, Klippel-Feil, Preiffer, etc.

Estimate of how many children have unilateral hearing loss

- Estimated prevalence of identified newborns with hearing loss is 3:1000
- PA estimate = 87 children born per year with UHL
- Estimated school age prevalence is 1% of children served by SpEd
- PA estimate = about 2300 with UHL who have learning needs (based on 2010-2011 enrollment)
- **There is a substantial rise in the number of children with UHL from birth to school-age! Are you finding them?** Also, approximately 1 in 4 children with UHL (not due to atresia) develops permanent hearing loss in their better hearing ear before school-age. **Is hearing being tested?**

UHL Language Outcomes

- Unilateral - total language score mean of 91.78 = almost 10% lower than 'average' development.
- Age equivalent gives an average language delays of 6 months for children with UHL. Performance is variable and not correlated with severity of impairment or side of impairment. Study by the Developmental Disabilities Institute Wayne State Univ, Detroit MI
- Expressive language delays develop in about 1/3 of children with UHL – but not until 15-18 months Colorado

Turn-and-Talk What kind of language outcomes have you seen for toddlers with UHL? When do delays appear, if any?

NOTES:

Potential behavior & social issues: Children with unilateral hearing loss may find it hard to hear directions and soft speech. That can lead to frustration and poor behavior. One out of five children develops behavior or social issues. As children get older they may think that other people are talking about them when they really just did not hear what was said, especially by peers.

UHL and Disadvantages to Listening

- Poorer ability to listen and localize sound in noisy environments
  - Lack of 'additive' listening with 2 ears providing a 3-6 dB advantage (*binaural summation)*
  - Lack of tiny time differences perceived between ears that allow people to localize direction of sound (*interaural time and intensity differences)*
  - Lack of *head shadow effect* as sound goes around the head, making sound from one side 6.4 dB quieter by the time it reaches the other side – substantial effect when listening in noise
  - Lack of advantage using 2 ears together to minimize the effects of background noise and reverberation (*binaural squelch)*

Effects of UHL on Children's Listening Behaviors

- More difficulty localizing sound than peers. Amount of difficulty increases with the degree of HL.
- Poorer performance listening at any noise level when the noise is toward the normal hearing ear and the speech is toward the poor hearing ear. May also perform more poorly as compared to peers when speech is toward the normal ear and noise toward the poor ear.
- Need speech to be at a louder level than background noise (better S/N) than peers with 2 normal hearing ears
- Smaller **listening bubble**, especially in noise or for sounds from 'bad side'

Summary of Challenges with Only One Good Ear

- Poorer ability to listen in noisy environments
- Poorer ability to localize sound
- Need speech to be louder than noise!
- RESULT: 10x risk of school difficulty/failure

Recommendations of the Audiology Profession

The Pediatric Workgroup on Hearing Aid Amplification (Bess et al, 2000) summarized the literature and stated that for children with unilateral conductive or sensorineural hearing loss, amplification should be considered on a case-by-case basis, based on the child's audiometric data, development, and communication needs.

So what are the choices to help children hear better?

1. Traditional hearing aids
2. CROS hearing aids
3. Bone conduction hearing aids PARENTS WILL ASK YOU!
4. Bone anchored hearing aids
5. FM system with any of the above
6. Reconstruction surgery for children with atresia

Traditional hearing aids: Most appropriate for children who have mild or moderate hearing loss in their poor ear. Goal is to improve hearing so it is symmetrical between the ears.

CROS hearing aid system: Contralateral Routing of Signals means that a microphone/hearing device is on the poor hearing side sending sound from that side to a hearing device on the good hearing ear. Mainly for those with severe/profound hearing loss who can't attain 'balanced' hearing from aids.

Traditional Bone Conduction Hearing Aid: Vibrator on a headband must press into the skull with 4 pounds of pressure. Cord in headband goes over the top of the head to a hearing aid attached to the other side of the headband. It sends sound through the head to the working cochlea(s). Disadvantages: Compromised sound quality (skin is a barrier making the signal quieter, especially high frequencies). Uncomfortable or painful – can create pressure sores. Difficult to keep in place (not secure), especially on young children!

FM system: Child wears an FM receiver with any hearing device. Mom, other family member, child care provider, teacher wears a microphone. Child hears voice like she was only 6" from ear. Overcomes distance, background noise, 'focuses' attention on sound.

NOTES:

Amplification Findings for UHL :FM systems are the only assistive technology that has been found to improve word recognition abilities in quiet and in noise for children with UHL in all listening conditions

- Early study (1994) of 6 children; 5-12 yrs: CROS aid and traditional hearing aids do not enhance speech understanding and may be detrimental when listening in noise
- 2010 study of 12 children; 6-14 yrs: Younger children (6-9 yr) who were fit with their first hearing aid by age 5 showed bilateral benefit in sound localization when using the aid in their poor hearing ear. Older children (10-14 yr) who were fit at age 7 or older showed bilateral interference in sound localization when a hearing aid was used – the hearing aid was detrimental to localization. Early intervention was linked to bilateral benefit. Children's ability to localize improves with time, with or without hearing aids (i.e., children learn to rely on spatial cues). So, if a hearing aid is going to be fit to a child with UHL, it should happen in Early Intervention. Waiting until kindergarten will likely result in rejection.

Survey results of audiologists: Study by the Developmental Disabilities Institute Wayne State Univ, Detroit MI

- Level below which Audiologist would not consider providing aids for UHL: 25dBHL
  Level above which Audiologist would definitely provide aids for a child with UHL: 0dBHL

Not all audiologists think it is important to fit young children with UHL with hearing aids...

BAHA - What is it?

- In 1984 a device was introduced called the Bone-Anchored Hearing Aid. Technology that transmits sound by vibration through a transducer that is coupled directly to the skull via a titanium implant anchored in the temporal bone. For children with atresia, unsuccessfully treatable ear infections or who have one ear with severe/profound loss, also called "single sided deafness" or SSD. History: FDA Clearance
  - 1996 – Approved for conductive & mixed hearing loss – in children ages 5 and older.
  - 2001 – Approved for bilateral use in children 5 and older.
  - 2002 – Approved for use in patients with unilateral sensorineural hearing loss (SSD).

BAHA Softband

- Can be used in younger children (under age 5) when they are too young for the surgery.
- Can be used with any patient if surgery is not an option or if patient isn't sure.

Implantable Bone conducted hearing aids: How do they work?

1. Sound picked up by microphone(s) on sound processor
2. Sound transmitted by the abutment & implant (two parts)
3. Sound travels through the bone/skull to inner ear, bypassing outer & middle ear areas.

BAHA Manufacturers

- Cochlear (Main Headquarters in Australia also in Colorado)
- Oticon Medical (Main Headquarters in Sweden also in New Jersey)
- Sophono (Main Headquarters in Colorado) - Uses a MAGNET, not an abutment

BAHA Advantages

- The anchoring the device to bone provides an advantage of 10 to 15 dB, especially at the high frequencies of vital importance to proper speech recognition in noise. Compared to conventional bone conductors, the BAHA system has better gain at the high frequencies and less distortion.
- **So why aren't bone anchored devices implanted earlier? Complications!**
- In Europe the BAHA has been implanted successfully in children less than 3 years old however, the fixture (titanium implant) has a higher rate of fixture loss. Fixture failure rates: children < 5 years = **40%;** children 5–10 years = 8%; children > 10 years 1%.
- As compared with adults, children have greater issues with the fixture becoming buried in bone, the skin becoming thickened and needing to be reduced, and personal hygiene around the site of the abutment that can cause problems with the skin and site of connection. Sometimes a second 'sleeping fixture' is implanted so that a solution is readily available in the case of fixture failure.

NOTES:

What do we know about the success of BAHA softband in young children?

- Studied age 1 m – 5y6m; average age 2y3m with bilateral atresia. Compared with control group using conventional bone conduction hearing aid. Parent survey results: Equitable time worn per day (7 BAHA vs 8 hrs BC); fewer issues with pressure points; BAHA more comfortable. BAHA softband may still result in a hearing level of 25-30 dB HL. Once the BAHA is implanted, hearing level improves to about 15 dB HL 2008 Netherlands study: 12 children -BAHA softband
  - Language outcomes - example of one child with bilateral aural atresia from 2008 Netherlands study: typical development initially, declined to delays present at 36-46 months while using softband. After BAHA implantation at 44 months the development improved and gap closed by 60-72 months. Emphasizes the critical impact of hearing worse than 15 dB HL.

What's the big deal?

- 25-30 dB – that doesn't sound like a much! Simulation of normal hearing, 20 dB & 30 dB loss.

Turn-and-Talk How do you think these 'little' hearing losses could affect early development?

What do we know about the success of BAHA softband in young children with bilateral aural atresia?

- Study of 6 children with BAHA (2007) – No positive effects on directional hearing. In some cases directional hearing was worse. Most used the device only a few hours a day. No convincing evidence for BAHA in children with unilateral hearing loss (not atresia) when using the softband.
- **Hearing Level and BAHA - 1** 2008 Netherlands: study
- Average aided hearing loss: BAHA 27 dB, bone conduction (BC) aid 25 dB; so hearing level with either is 25-30 dB HL
- **Hearing Level and BAHA - 2** 2010 Arkansas study of 10 children; 6m – 16 yr
- Hearing with implanted BAHA and BAHA softband about the same (15-20 dB), traditional bone conduction aid (25-30 dB).

Insurance / Coverage

- BAHA is a 'prosthetic device' and not a hearing aid. Medicare has coverage– no prior authorization needed. Other insurances also follow Medicare's lead & cover BAHA. Most insurance requires a prior authorization or pre-determination request be made before surgery is scheduled. Manufacturers give guidance/samples to use. Insurance may/may not pay for sound processor if it isn't going to be implanted for several years as it is likely that it may need to be replaced.
  Cost of the Sound Processor: the parts that would be worn with a softband for infants to kindergarten varies from $3200 - $3800. Typical hearing aid is $1500-$2500 (may be much less under State Medicaid.

Improvement via Reconstructive Surgery

- Ability to listen binaurally was measured after surgery for unilateral conductive HL. Results within the normal range. No difference in outcomes based on age at time of surgery – 10 yrs to 45 yrs. No convincing evidence of benefit of early reconstructive surgery for unilateral conductive hearing loss
- Reconstructive surgery for bilateral conductive HL results in worse hearing ability than BAHA. BAHA closes the ABG at most frequencies versus 25-30 dB ABG remaining after reconstructive surgery. This is true only after the BAHA has been implanted.

Benefit & Quality of Life: Use Patterns Findings Unilateral (15 children age 4-16 yrs):
47% using 8+hrs/day**;** 40% using 4-8 hrs/day**;** 67% said it was 'worth the effort'; greater benefit when the BAHA was fitted at an early age**.** Positive benefit in learning domain for BHL & UHL

Hearing Aid Wear Patterns

- 2000 - 35 children with hearing aids; parent rating: Children with UHL wear their aid less than children with BHL**.** Children with mild to moderate UHL accepted their hearing aids while children with severe to profound UHL did not (i.e., BAHA candidates).
- 2002 – 31 children with UHL, age 1-10 yrs: 81% with mod/sev or better UHL used the aid. Those with sev/prof reported little/no use.

NOTES:

Subjective Benefit

2002 – 20 children, 2-17 yrs, UHL mild to mod/sev. Results of retrospective **parent surveys.**

- **72% of parents felt their child improved or greatly improved using a hearing aid in the poor ear in various listening situations**
- **100% were happy they chose to have their child fit with a hearing aid**
- **50% of parents expressed that they wished a hearing aid were fit sooner.**

Summary of what we know…

- Unilateral hearing loss causes developmental delays – at least in 1/3 to 1/2 of children
- Possibly 1/4 will develop hearing loss in the better ear so it is important to monitor
- Language, attention, social, behavior issues
- Best success is for children with 26-70 dB loss in one ear to be fit with a hearing aid as infants (50% of families wish they had gotten a hearing aid sooner)
- BAHA with a softband appears to have result in best hearing and language outcomes for children who have 71+ dB hearing loss; again fit as infants

Support for Families – Website: The Ear Foundation BAHA Users Support: http://www.baha-users-support.com/cgi-bin/2bb/2bb.cgi
Ear to Ear Foundation Mission is to provide funding for BAHA to children in need http://www.eartoearfoundation.org/p/about-us.html

BREAK EXERCISE! Experience Unilateral Hearing Loss

- Insert ONE earplug into your ear canal firmly. Leave it in throughout the break! Communicate 'normally.

– Challenges understanding:

– Effort to communicate:

– Attention level required:

– Others?

PART 2: How can we share what we know with families?

Standardize your message to parents – from diagnosis to referral to first meeting HANDOUT Generic UHL brochure

Disclosure

- This information is presented based on the Developing Child with Unilateral Hearing Loss Guide for Early Intervention Providers; Uses a 100-slide PPT and 25 handouts for families. Key concepts will be shared!

At the end of Part 2 you will be able to:

1. Describe the possible effects of unilateral hearing loss on learning and future hearing
2. Use analogies to help understand potential effects and the need for action
3. Know how to use available materials and services to strive for best child outcomes

First home visit after diagnosis

1. Start your home visit by asking families to "tell their story" including describing the diagnostic appointment.
2. Share information that conveys your empathy with the emotions they may face due to their child's diagnosis
3. It can be anticipated that the families who received *the* ***Unilateral Hearing Loss*** **brochure** will be interested in discussing this information.
4. Be prepared to answer questions briefly, stating that you and the family will discuss these issues in depth during future visits.
5. Provide information about how ears work together and talk a little bit about the analogy (to be described)
6. Urge the family to experience hearing loss through use of earplugs. If possible, provide them with one or two sets of ear plugs. Let them know that you will discuss their thoughts from these experiences at the next visit.
7. Before you leave, emphasize the importance of returning to the audiologist for the hearing recheck within 3-4 months. If the family does not seem to be familiar with the need for this appointment share information about the potential for hearing to change.

Share information that conveys your empathy with the emotions they may face due to their child's diagnosis

- You expected your baby to be perfect.
- It doesn't seem real that your baby could have any problem.
- When a baby is so young it is hard to believe that hearing tests can be accurate. Hearing tests <u>are</u> very accurate, even when babies are only days or weeks old.
- Hearing loss in one ear is as much a part of who she is as her eye and hair color. As parents, you will want to understand what it means to have good hearing in only one ear.

Provide information about how ears work together and talk a little bit about the analogy

- How bad can it be? The good ear will compensate for the bad ear, won't it?
- An analogy to help us understand: Think about a child who was born with only ½ of one foot. We require two feet to equally support the weight of our bodies as we walk. With only one normal foot, a child will still learn to walk and run, but likely not as fast or smoothly as children with 2 normal feet; especially in rough terrain or when competing in a race. Can the one good foot really compensate for the ½ foot? No, but having only one good foot works fine in many situations.
- Rugged terrain: Think again of the child with ½ foot playing with other children in a large park with grassy areas, rocky climbing areas, and an obstacle course to jump, skip and hop. She <u>will</u> have difficulty experiencing some of the things to do at the park. What do you think "rugged terrain" would be for listening?
- The analogy of the child with ½ foot is a starting place to understand that 2 ears are really needed, and one ear cannot do the job of two ears. There is <u>at least one big difference</u> as we think about the child with only one normal foot and your child with only one normal ear – <u>listening</u> is strongly tied to the ability to learn at home and at school! <u>A foot problem will likely not impact learning.</u>

NOTES:

Urge the family to experience hearing loss through use of earplugs.

- You need to experience it yourself. Buy foam ear plugs. Activities to do in your 3 hours: Spend time talking quietly with someone with the television on in the background. Have someone talk to you from another room or from across a large room Use some of the *ELF* listening activities when you are not looking at them, when you are reading or doing something you really enjoy or that interests you, with and without background noise. How much effort did it take you to listen?

Turn and Talk

- Do you think the analogy of the ½ foot would be useful as you work with families?

Before you leave, emphasize the importance of returning to the audiologist for the hearing recheck within 3-4 months

- Hearing does not always stay the same. Any additional hearing loss In the better hearing ear Or in the poor hearing ear **WILL** increase the child's chance of developing greater listening, language, behavior and learning issues. This does NOT mean that ¼ of these children become deaf in both ears, just that some amount of additional hearing loss – *great or small* - will develop.
- Return to the audiologist for a hearing check-up every 3-4 months until the child is 3 years old or the audiologist says that testing this often is no longer necessary. Next appointment _____

Second Home Visit

1. Begin with referring to the analogy of the ½ foot. Ask the families what they think "rugged terrain" would be for listening. When is it most challenging to listen even with two good hearing ears?
2. Family members will likely come up with noisy listening situations or when speech is distant.
3. Those who have already experienced mild unilateral hearing loss should be encouraged to share their experiences at this time.
4. If the family members have not taken the time to experience unilateral hearing loss encourage them to think about challenging listening situations.

Ask the families what they think "rugged terrain" would be for listening.

- Rugged listening terrain: distance and background noise
- Hearing is a distance sense: We monitor what is going on around us with our hearing. Two ears working together hear just a bit better than one ear working alone. We turn our heads to use both ears to locate where sound is coming from.

Family members will likely come up with noisy listening situations or when speech is distant.

- Language is caught, not taught! For language to be 'caught it needs to: 1) be in the child's listening bubble, 2) be of interest to the child, 3) interactive and meaningful if a child is going to learn new words and concepts.
- Hearing 'through' noise: People have 2 ears to help them locate sound and also to help listen in noise. Without even being aware of it we use both ears when we are listening in noise by pointing one ear a bit more to the person we are trying to listen to and the other ear a bit more toward the noise. Our heads actually help to block out a bit of the noise so the one ear can 'tune in' better to the speaker or preferred sound.
- Listening in noise with one ear: Children with only one normal hearing ear have greater difficulty locating where sounds are coming from and understanding speech or recognizing sounds when there is competing noise. Children with one hearing ear will need more time to locate sounds and it will take more effort to focus on sounds in background noise. They are more likely to 'tune out' in noise.

NOTES:

Third Home Visit ELF is at: http://successforkidswithhearingloss.com/tests/tests-by-karen-anderson

1. Review the family's ELF findings and/or collaborate with the family to identify the child's responses to the different ELF sounds. It is suggested that listening at 10 feet and 15+ feet and the effect of noise be demonstrated.
2. Relate ELF results to the concept of the listening bubble and how near adults should be if they expect their child to hear them
3. Reinforce the concept of Language is Caught, Not Taught as you discuss the listening bubble.
4. Discuss POTENTIAL IMPACT ON LANGUAGE LEARNING
5. Discuss FOSTERING LANGUAGE GROWTH
6. Discuss POTENTIAL IMPACT ON BEHAVIOR.
7. Discuss choices and CONSIDERING HEARING AID USE. Discuss the advantages of 'balanced hearing' Review the concepts of listening at a distance and in background noise and how balanced hearing would be helpful
8. If the family has not been in contact with another 'veteran family' of a child with UHL offer to facilitate that contact.

Discuss POTENTIAL IMPACT ON LANGUAGE LEARNING

- One out of every three children with only one good hearing ear develop delays in the number of words they say by the time they are 15 – 18 months old.

Discuss FOSTERING LANGUAGE GROWTH

- Language learning, every hour a child is awake, every day, everywhere. Babies learn language by hearing it around them every day. Parents don't 'teach' children to learn how to talk. Your child will learn language whenever you interact with him and as he sees you communicate with other people. Language is caught, not taught. What is incidental learning?
- For language to be 'caught…Language needs to: 1) be in the child's listening bubble, 2) be of interest to the child, 3) interactive and meaningful if a child is going to learn new words and concepts.
- Born and ready to grow! Children's brains are ready to start to learn language as soon as they are born. Picture your child's brain as an acre of rich soil that is read to grow an incredible garden. Your child's garden of language – this acre of rich soil – needs to be filled with blooms and thriving plants by the time he or she is 3 years old. A whole acre! Having good GARDENERS – people who really know how to grow plants – will help. Having many gardeners will really help!

Discuss POTENTIAL IMPACT ON BEHAVIOR

- Children with unilateral hearing loss may find it hard to hear directions and soft or distant speech. That can lead to frustration and poor behavior. One out of five children develops behavior or social issues. Children need to know the expectations, why it is wrong (hurt, dirty, impolite, mean), and to be praised when they are behaving well. They also can learn by overhearing when another child is scolded or warned.Warnings should be given in close, no background noise, when the child is paying attention. Explain again and again – the why of expectations (*this builds language too!)*
- Make sure your child really heard *and understood* the warning before you punish
- Those subtle social rules

Discuss choices and CONSIDERING HEARING AID USE

- WHAT TO DO – Advocate! Some physicians and audiologists may not be aware of the research we about the potential learning consequences to 1/3 to 1/2 of children with unilateral hearing loss. We do not know how to predict which children will be affected – it could be <u>your</u> child. You may prevent issues from developing by helping your child now!
- WHAT TO DO – Test & Retest! Since one out of every four children with unilateral hearing loss develops hearing loss in the better ear it is critical for your child to have his or her hearing checked by the audiologist regularly. Every 3 months to age 1 year. Every 6 months from 1-3 years. Get prompt medical care for suspected ear infections. Teach him to avoid loud noise!
- What are your real choices? a)**.** Do what you can to help prevent listening, learning and social problems by allowing your child to hear his or her best – every day, in every situation. b). Hope that he will get by, realizing that language, self-esteem, and behavior are likely to be affected by the hearing loss. Will he still "be all that he can be"? Probably not, but that may be acceptable to you. c). Wait and see if he will be affected, even though this will lose learning time that can never be made up. Children who wait to get hearing aid(s) until closer to school age typically do not adjust very well (see b).

NOTES:

- Try a hearing aid. If your child has hearing in the worse ear (i.e., thresholds between 35 – 75 dB) then it may be possible for a hearing aid to 'balance out' the child's hearing ability – meaning provide near normal hearing in the poor hearing ear. Amplification could help with sound location and listening in noise! Children who are deaf in one ear *may* have too much hearing loss to cause improvement with a standard hearing aid. Ask your child's audiologist for more information.
- A hearing aid! But he hears fine in one ear! Think back to our analogy with the child who was born with ½ foot. If there was a prosthesis (like a 'strap on foot') that would allow the child to walk gracefully with a normal gait, to run similar to, but maybe not as fast, as other children - would it make sense for the child to use it? Would it help him as he is learning to walk? Would it help him fit in better when playing with other children because he could keep up more easily?
- Hearing aid = a brain access tool. Brains develop due to constant stimulation. With ¼ of children developing hearing loss in both ears, early stimulation of the poor ear may end up making a real difference in the child's ability to compensate if all or most hearing is lost in both ears. Think of it as 'keeping an ear in reserve if the worst happens (and it may!).
- How soon should we try a hearing aid? The earlier a child tries amplification and gets used to 'balanced hearing' the easier it will be for him or her to adjust to hearing with both ears and want to wear the hearing aid all the time. Waiting until school-age is too late!
- Parent comments on hearing aid use: Other parents of children with unilateral hearing loss have tried hearing aids and said:
  - *· He doesn't talk so loud when wearing his aid.*
  - *· He was missing one half of everything before he got his aid.*
  - *· He hears sounds he never heard before.*
  - · He d*oesn't interrupt people in group situations now.*
  - *· It is a very positive thing.*
  - *· Audiologists and doctors say children with only one good hearing ear will be fine—they are not fine!*

Home Visit Dedicated to a New Hearing Aid

- When a family has chosen to try a hearing aid it is likely that at least one home visit will be dedicated to getting them started: instructing earmold insertion. hearing aid monitoring , the Ling 6 Sound Test, coaching them on times that they can tune in to observe the benefit of the hearing aid. *EVALUATING HEARING AID USE*

After the child has had the hearing aid two or three weeks he or she should be wearing it most waking hours.

- At this point **repeat the ELF activities** with them to see if there has been any change in the size of the listening bubble or other observable benefits. Provide the family with the *Early Listening Function Infant and Young Child Amplification Use Checklist* (part of the ELF).
- It is important that the family share their observations on the validity of the hearing aid fitting and its benefit with the audiologist before the end of the first 30 days.
- Reasonable Expectations for Hearing Aid Wear. During the first few days of use, put the hearing aids on your child *3-4 times a day for 15 - 30 minutes each time. Goal is full-time use within 3 weeks of hearing aid fitting.* Changes may be subtle and can improve over time as the child learns to listen with 2 ears and gets practice in challenging situations such as listening across distance and in background noise. The ***Early Listening Function*** activities at a distance may help identify changes.

4th and 5th Home Visit

1. Help the family check the hearing aid and discuss any issues with daily wear.
2. Talk more with them during this home visit about 'keeping the language teacup full.'
3. Get across the importance of quantity of language used
4. The early intervention teacher or speech language pathologist can then use their customary materials for helping families learn about communication strategies
5. Introduce the concept of monitoring the child's language development to the family

Good Resource for Families! Talkability by Hanen http://www.hanen.org/Guidebooks---DVDs/Parents/TalkAbility.aspx

NOTES:

Talk more with them during this home visit about 'keeping the language teacup full.'

- Provide them with a list of words, such as those found on the MacArthur **Communication Development Inventories Checklists** and encourage them to hang the list on the refrigerator.(http://successforkidswithhearingloss.com/resources-for-professionals/early-intervention-for-children-with-hearing-loss). Communication **monitoring should occur at least at 6 months intervals, starting at 9 months of age**. Remind the parents that children with unilateral hearing loss who end up with language delays **often do not have problems until they reach 15-18 months old**. Do language checkups regularly
- 30 Million Word Gap: Research in the following years found a high correlation between vocabulary size at age 3 and language test scores at ages 9 and 10 in vocabulary, listening, syntax, and reading comprehension. There was a 30 million word gap between the vocabularies of welfare and professional families by age three. http://archive.aft.org/pubs-reports/american_educator/spring2003/catastrophe.html
- 20,000 hours of listening. To learn to read, children's brains need to be exposed to 20,000 listening hours (5+ years).
- All of this input is needed before the brain makes the connection between the sounds and their corresponding letters of the alphabet. Without those 20,000 hours of listening children are less ready to read at the same rate as other children their age – and they may never catch up.

Summary Information

- Hearing in only one ear **IS** a big deal. Children with issues related to hearing loss in only one ear do not outgrow them by school-age. Children with unilateral hearing loss are at 10 times the risk for school problems as those with 2 good ears.
- We do not know what predicts problems! Get help. Most states provide services to families of infants and toddlers (to age 3) who have unilateral hearing loss.
- Help to 'keep the language cup full.' Families are a child's first and most important teachers. Early intervention teachers can help families to learn how they can communicate with children in ways to really stimulate language learning during everyday activities.
- Track how your child's language is growing. At least every 6 months your early intervention teacher will check how your child's language is growing. Ask for a list of typical vocabulary to hang on your refrigerator as a reminder. Remember, children with normal hearing in one ear can develop language at a normal rate until 15-18 months.
- Behavior and social rule learning. The early intervention teachers can also help you to teach proper behavior to your child – consistency and being sure the child really understands is the key! Describing and role playing social interactions can start very early and really help a child's self-esteem and understanding by the time he or she starts school.
- Help when trying a hearing aid. Most people have not used hearing aids or ever seen one on a young child. Early intervention professionals typically include teachers of the deaf and hard of hearing or speech language pathologists who can help you learn how to accomplish daily hearing aid wear. They can also help you to watch for improvement in listening behavior. Do the ELF with the help of the EI teacher.

Summary

- Your child has a hearing loss that will affect him throughout his life.
- Your child's hearing *may* change.
- Try amplification as early as possible.
- Without early assistance your child may develop language delay and/or social or behavioral issues.
- Children with unilateral hearing loss are at 10 times the risk for school problems.
- Get help from early intervention ASAP!
- Monitor language growth regularly.
- Plan for your child's transition to school.

Team Think Picture a family you work with:

- Would the experience (earplug) be helpful?
- Discuss how you picture yourself using different parts of these materials
- What can you do different next week?

BREAK EXERCISE! Experience Mild Hearing Loss. Insert BOTH earplugs into your ear canals. Leave them in **throughout the break.**

Communicate 'normally'. Be ready to discuss:

- Challenges understanding
- Effort
- Attention
- Effect on development?

Part 3: What we know about permanent and fluctuating mild hearing loss

Relative Prevalence by Degree of Hearing Loss: For every 1 child identified with bilateral severe to profound hearing loss there are 2 with moderate and 9 with mild degrees of hearing loss. Even conservatively there should be 2x the number of children with mild loss served compared to the total of all other degrees.

Estimate of how many children have mild hearing loss: Due to technology, only the children who have mild hearing loss at 40dB will be identified by newborn hearing screening. This means that all children with hearing loss at 25 dB and 30dB and 35 dB will be missed. CDC/EHDI – 20% of identified children had mild degrees of permanent hearing loss (2009). This means that for every child identified with hearing loss there are approximately 2 with mild hearing loss that will only be identified when speech/language delays arise! How many children with mild loss do you have on your caseload now?

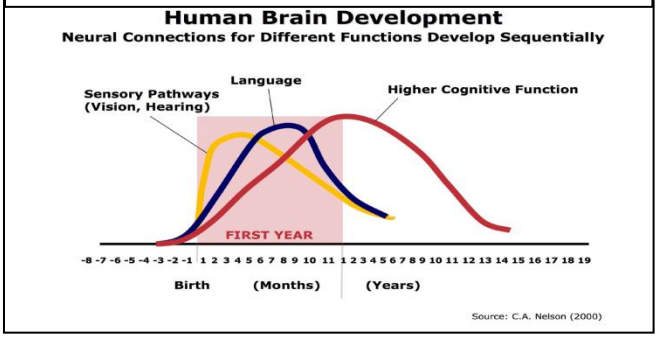
How much difficulty? Would you agree? One study asked parents to rate how much difficulty a child with mild hearing loss would have. 0 = no problems to 7 = extreme problems. After thinking about "mild hearing loss" the average rating = 2.7. After actually listening with a mild hearing loss the average rating = 5.3 and they judged it to be "serious", "handicapping" and it would be important: (1) for the child to wear hearing aid(s) (2) to sit close to the teacher Haggard, R. S., & Primus, M. A. (1999). Parental Perceptions of Hearing Loss Classification in Children. *American Journal of Audiology, 8*(2), 83-92.

Brain Development & Hearing Loss

Hearing typically starts about 4 months gestation. It contributes to the early foundation of development of neurons – the basis of language and future learning. **Why hearing aids can't wait.**

- At birth, each neuron in the brain has approximately 2,500 synapses, or connections. As a result of constant sensory stimulation and experiences with the world, the number of synapses grows to 15,000 synapses per neuron by the time an infant is 2-3 years old. This amount is about twice that of the average adult brain! Then something called "synaptic pruning" starts to happen. The weaker synaptic contacts are eliminated while stronger connections are kept and strengthened.
- A baby's experiences determine which connections in the brain will be strengthened and which will be pruned away. Ineffective, unused or weak connections are "pruned" away.

http://developingchild.harvard.edu/index.php/resources/briefs/inbrief series/inbrief the science of ecd



For most children, the single most effective means to address learning and development issues associated with hearing loss is through the consistent use of hearing technology (hearing aids, cochlear implants, BAHA, FM).

Psychosocial development – Potential impact of hearing

- In the first 12 months of life babies are learning trust versus mistrust.
- The challenge in this stage of development is to prevent children from perceiving that the world is inconsistent, which teaches that it is undependable, unpredictable, and possibly dangerous.
- Parents/caregivers need to recognize how being able to consistently overhear people talking within a certain distance builds trust.

NOTES:

Hearing aid wear for ALL waking hours

- Provides consistent auditory input
- 'Hearing the child (and family) can count on'
- 'Bond' with the hearing aids in the first 12 months of life!

Expectations for Hearing Aid Wear -*Nothing less than full-time!*

"If your baby wears hearing aids only four hours each day, it will take six years to give him as much listening experience as a normally hearing infant accumulates in one year." Stovall, D. [1982]. *Teaching Speech to Hearing Impaired Infants and Children.* Springfield, IL: Charles C. Thomas.) HANDOUT

Imagine being a 9 months old and crawling. You see a houseplant in the corner of the room and want to explore what it is. Mommy is on the other side of the room. As you start to crawl toward the plant, she sees where you are going and says "no, no – we don't touch plants." Her voice isn't angry. You know the words no-no and she has now linked no-no to the plant. You consider other places you can crawl.

Contrast this with not being able to hear Mommy tell you no-no. You continue to crawl toward the plant. She sees you disregard her warning and may tell you no-no again. You are now farther away and can't hear her voice at all. Suddenly Mommy picks you up. She has an angry face and voice. You don't know what you did wrong and you're scared.

Turn-and-Talk **"Classic" Unfair Spelling Test can be accessed at** http://successforkidswithhearingloss.com/demonstrations

Based on your experiences (earplugs, demo) what behaviors do you think children with mild hearing loss would have?

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

My child seems to hear so much, why should the hearing loss cause problems?

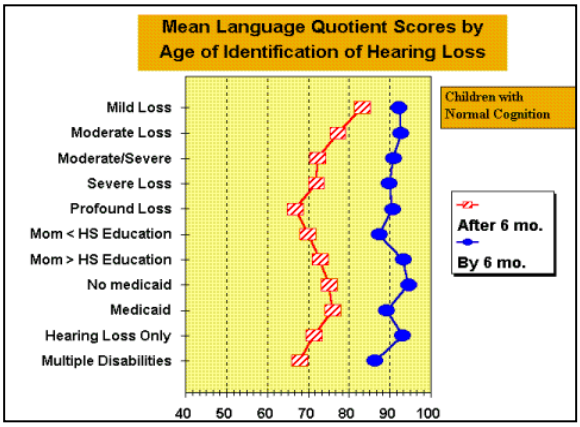
- He can **"hear"** but it takes more effort to **listen.**
- That effort means that less energy exists to understand what was said.
- ANY background noise will make listening much harder.
- Children with mild hearing loss may also develop problems getting along easily with others.
- Sometimes problems happen because what a parent expects of a child they *know* can hear does not match the reality that the child still has hearing loss.
- He will have challenges understanding in all situations, except when it is very quiet.

My child seems to hear so much, why should the hearing loss cause problems? continued

- "Passing" as normal hearing when you have a mild hearing loss doesn't work well because a child may miss 15 - 25% of words in conversation and 25-40% of words spoken quietly or at a distance of more than a few feet.
- Adults often believe these children aren't paying attention or choosing to not follow directions.

Challenges in Early Identification & Starting Early Intervention

- Children with mild loss are typically not identified by newborn screening, unless the loss approaches 40dB HL
- Parents of children with mild loss <u>are the group most hesitant</u> to provide amplification and receive in early intervention services.
- Early findings indicate that parents of children with mild loss have expectations of normal development and when the child has problems, issues with behavior, dissatisfaction, and acceptance of hearing loss arise. Waiting to intervene WILL cause delays!



What can YOU do to get parents to believe that mild hearing loss WILL impact their child's development?

1. Try not to use the label 'mild'
2. Talk about reduction to the child's "listening bubble" (i.e., ELF results from across room)
3. Simulate the hearing loss (earplugs, demos)
4. Use their experiences with communication difficulties with a mild hearing loss to help them understand their child's learning challenges with this much hearing loss.

NOTES:

About 90% of what very young children know about the world is learned incidentally, casually and passively. **Children with hearing loss require 3 times the exposure** to learn new words and concepts due to their reduced ability to easily overhear the language used around them. Only through the concerted effort of families, can children with hearing loss catch up and learn language at a rate similar to age peers.

MHL and Language Delays

- The degree of hearing loss we call 'mild' ranges from 25-40 dB HL
- One study found that children with 25 dB hearing were delayed in language 1.2 years. *Probably not in EI or identified by UNHS.*
- Those with 27-40 dB hearing loss were 2 years delayed.

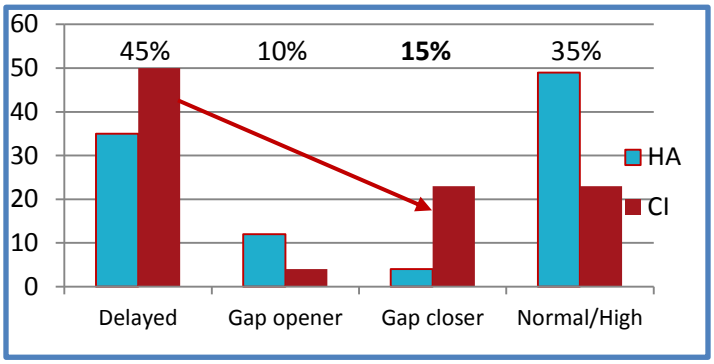
MHL Language Outcomes

- Total language score mean of 80.12
- Scores almost 10% lower than average
- Converting scores to age equivalent gives an average language delay of **24 months for children with a mild impairment**

Without amplification and appropriate early intervention, even a mild hearing loss will result in a kindergarten-age child with language levels closer to a 3-year-old.
Study by the Developmental Disabilities Institute, Wayne State Univ, Detroit MI

Both graphs from studies by Christine Yoshinaga-Itano

Language learning during age 4-7 years
Reality is about 85% of kids with hearing loss with delays at age 3 DON'T catch up by age 7.



Turn-and-Talk
Which information above will be most powerful for you to share with families? Underline, circle, star it!!

PA Requirements

The team must consider the infant's, toddler's or preschooler's language and communication needs, opportunities for direct communication with peers and professionals in the child's language and communication mode....

- Most likely auditory, not signing
- Access to peers includes how well the child will be able to access communication in a setting with peers – noisy!
- Child care/preschool is good for social exposure but challenging for language learning!

IFSP Areas of Focus –
Consider for children with MHL

- Supporting full-time amplification wear
- Frequent, high quality interaction
- Controlling noise in the environment
- Family aware of 'listening bubble' and how it will effect language exposure and learning
- Attention to social/behavior development

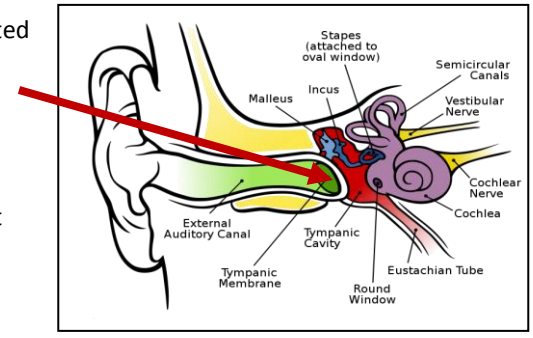
How does fluctuating hearing loss due to ear infections affect development different than MHL?

What is it?

- OME = otitis media with effusion; fluid behind the eardrum can be clear or infected or glue-like

Who has it? Almost every child!

- 90% of children have at least 1 episode between age 6 months and 4 years
- Half+ preschoolers have OME sometime during year
- 12% of the population has a history of frequent ear infections in childhood; most outgrow by 5 yrs
- Hearing loss from OME can range from 15-50dB!
- Linked to smoke in household, not being breastfed, attending large childcare centers and family history.



NOTES:

Doesn't OME just go away?

- Yes and no… 90% of cases clear up in 90 days That is with or without medicine!
- In 10% of cases the fluid (and usually HL) lingers. This is why physicians don't treat ("wait and see") until they have observed a problem for 3 months.
- The 10% who have ear problems that don't clear up should be referred to an ENT specialist.
- This is the group that MAY show some developmental or behavioral issues

Will there always be delays? MHL yes*, FHL no

- Depends on how often there is hearing loss and to what degree (i.e., 9 months at 35-50dB = missed language development)
- *May* contribute to 'mushy speech' but not long term
- Provides an extra disadvantage when there is another developmental issue
- One study found that 75% of school-age children who had gifted characteristics who did not score in the gifted intelligence range had long histories of middle ear problems.
- Families report concerns about inattention and early minimal language delays (i.e. Age 1-5)
- Delays will 'extinguish' by the time the children are in grade 2
- However, children continue to have greater difficulty listening in noise – a disadvantage in noisy active classrooms or childcare centers

Children with MHL and fluctuating HL can both show the following:

- Not following directions
- Asking you to repeat what you said
- Seems to be ignoring you
- Does not seem to pay attention to sounds or speech most children would be interested in
- Sometimes their speech can be more unclear than is typical for their age

Part C Eligibility (PA): A child is considered to be eligible for Early Intervention services if the child has any degree of **permanent** hearing loss, **mild and unilateral** hearing losses and is in need of early intervention services. Child with FHL may show speech, language and/or behavior concerns that would merit consideration for EI services, but **there is no eligibility based on FHL alone.**

Coaching families of children with FHL

- Seek medical help, keep going back!
- Stay close – communicate within your child's listening bubble (it changes as hearing changes)
- Be patient – ignoring or inattention may be due to hearing loss and not willful behavior
- Be sure to make time for literacy and language activities
- Get hearing tested!

REFER TO HANDOUTS ON MILD AND FLUCTUATING HEARING LOSS

Turn-and-Talk

What are your top 'take home' messages to support families of children with unilateral, mild or fluctuating hearing loss?

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