a.g.bell

Association for the Deaf & Hard of Hearing

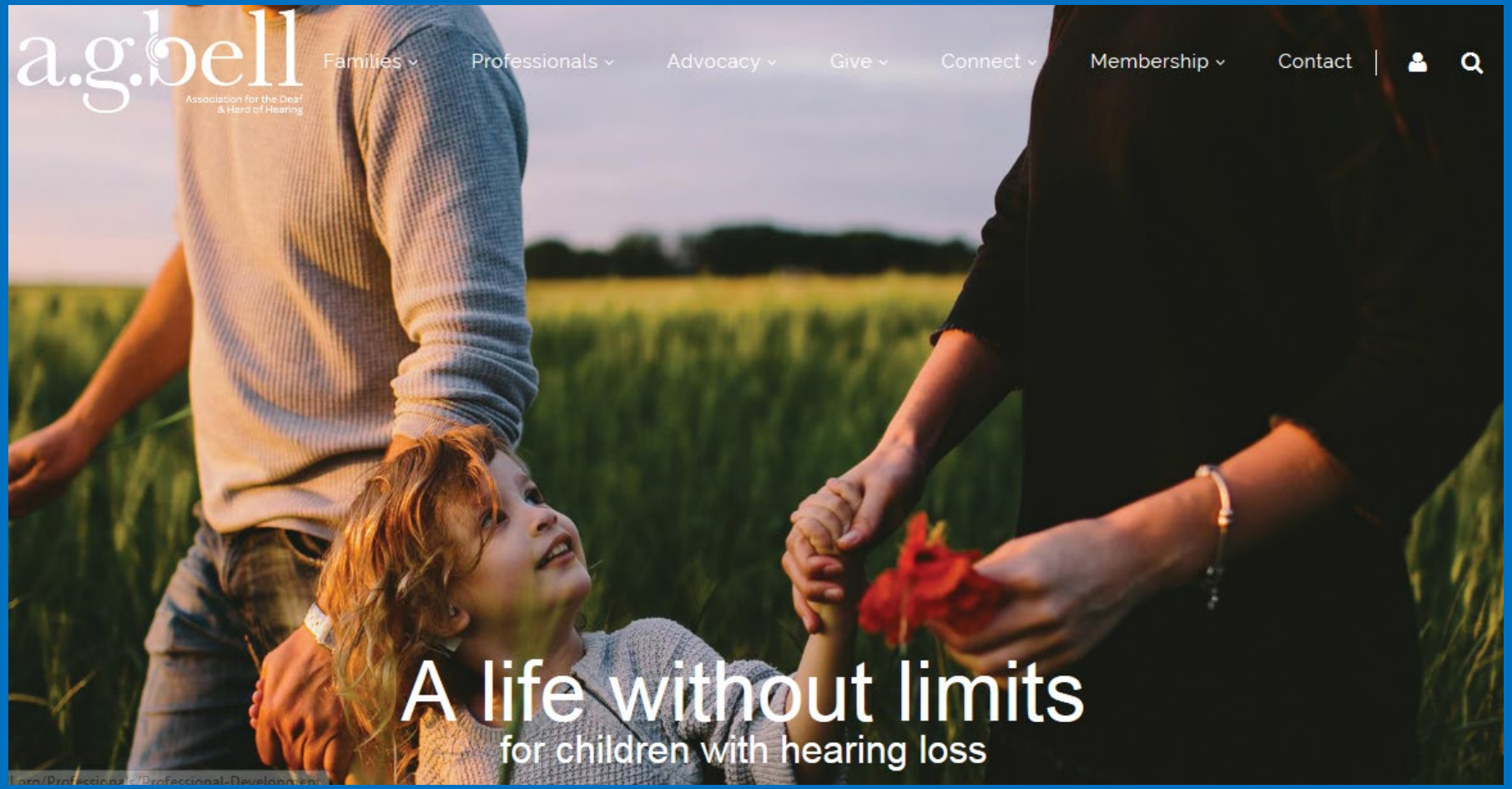
Listening and Spoken Language: From Start to Finish

EHDI Pre-Conference Workshop

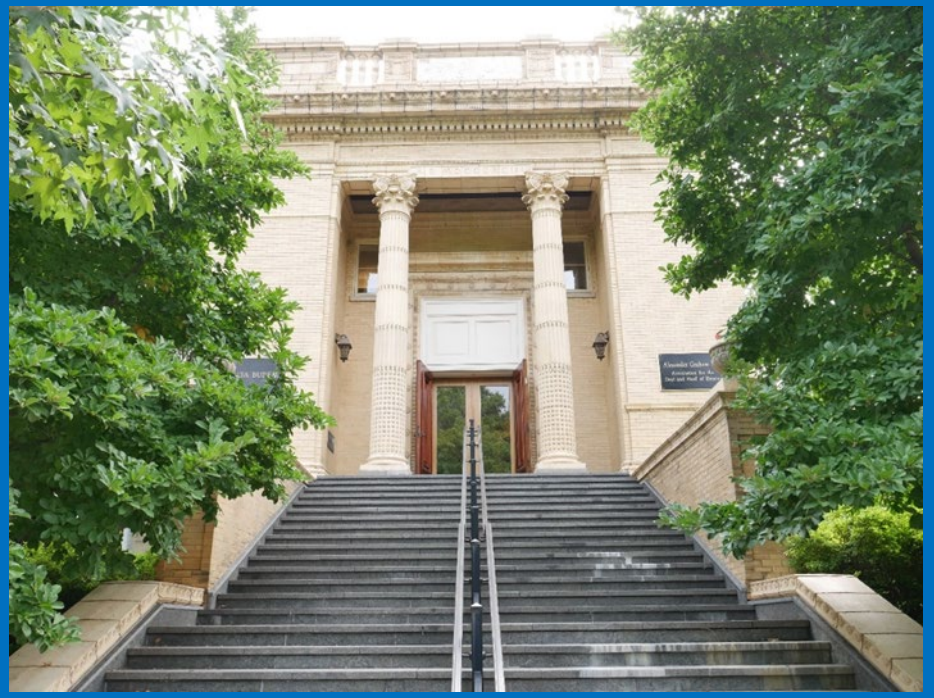
March 3, 2019

3417 Volta Pl NW | Washington, DC 20007 | Direct: 202-204-5220 | www.agbell.org

About AG Bell



AG Bell Since 1890



Workshop Presenters

Carol Flexer, Ph.D., CCC-A, LSLS Cert. AVT

Donald Goldberg, Ph.D., CCC-SLP/A, LSLS Cert. AVT

Gayla Guignard, M.A., CCC-A/SLP, LSLS Cert. AVT

Related Background and Disclosures Gayla Guignard

- Audiologist (CCC-A)
- Speech-Language Pathologist (CCC-SLP)
- Listening and Spoken Language Specialist Auditory-Verbal Therapist (LSLS Cert. AVT)
- Direct Service Provider (1989-2010); Administrator/Leadership Positions-(2003-current)
- Mother-Advocate, IFSP, IEP, Transition, Voc Rehab, Community Services, Life (1995-present)
- Salary Paid by AG Bell
- Board Member, Council on the Education of the Deaf

Learner Objectives

By the end of this course, learners will be able to:

- List the range of communication and language opportunities for teaching infants, toddlers, and preschool-aged children who are deaf or hard of hearing
- Describe the critical importance of excellence in audiology as the foundation of listening and spoken language development
- Detail key components of assessment and intervention that equip professionals, parents, and ultimately, children in optimizing access to hearing, and therefore, spoken language

Your Learning Tools

- Take-Away Handout
- Small Group Discussion of 2-3 minutes: Share Take-Away Gems (Presenters will walk from table to table)
- “Ask Anything” Question Cards
- Online handout and additional resources

Workshop Table of Contents

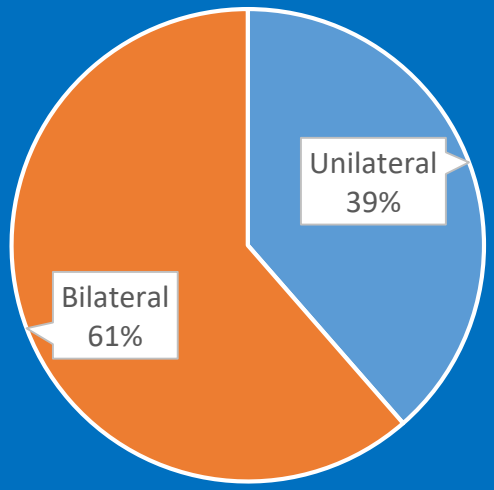
- The Big Picture: An Introduction to Our Topic
- Hearing Now: Creating a Neurological Context
  - Small Group Discussion
- Audiology: The Foundation of Listening and Spoken Language
  - Break
- LSL: Nuts and Bolts
  - Small Group Discussion
- Knowledge and Skills of Certified LSL Specialists (LSLS Cert. AVT/LSLS Cert. AVEd)
- How Does LSL Fit in with EHDI?
- Resources
  - Small Group Discussion

Getting on the Same Page- Data

Hearing Loss in One vs. Both Ears

EHDI, 2016 Babies

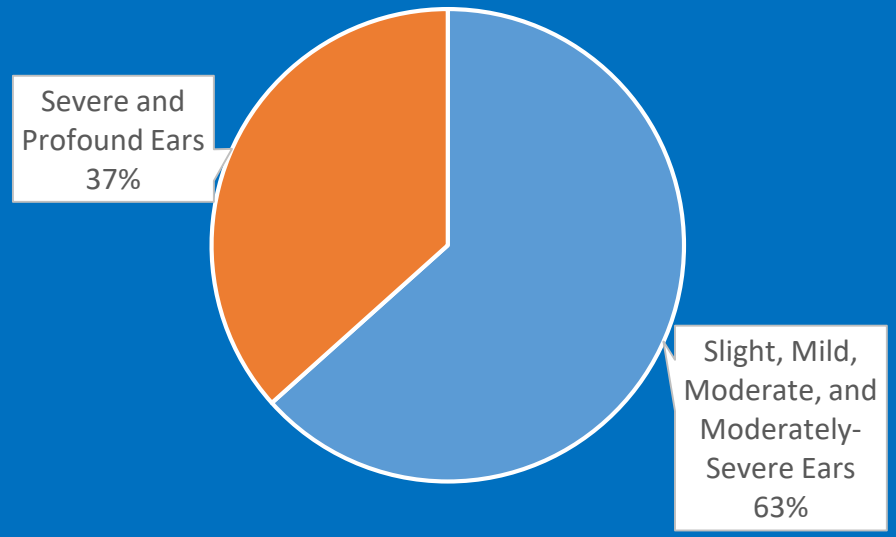
https://www.cdc.gov/ncbddd/hearingloss/2016-data/14-type-and-severity.html



Degree of Hearing Loss by Ears

EHDI, 2016 Babies

https://www.cdc.gov/ncbddd/hearingloss/2016-data/14-type-and-severity.html

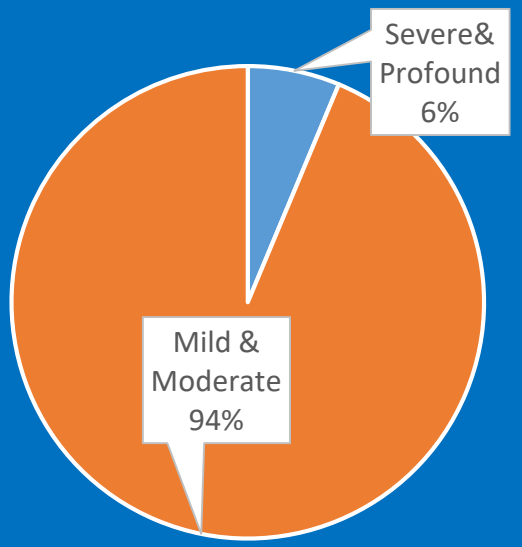


Degree of Hearing Loss by Person

NHANES II & III Prevalence Ages 6-19 years

Donahue (2007), Eisenberg et al. (2007); Tomblin & Hebbeler (2007)

Retrieved from 11/15/17 handout, Longitudinal Outcomes of Children with Mild to Severe Hearing Loss: Auditory Experience Matters, Mary Pat Moeller, Ph.D



Getting on the Same Page- Communication Options/Choices/Opportunities

How do Children who are Deaf or Hard of Hearing Communicate?

Individually and Specifically
Uniquely, yet Predictably
In Lots of Different Ways
No One Size Fits All!

Getting on the Same Page- Myths and Misconceptions

Getting on the Same Page

- Myths and Misconceptions
  - We all have them. What are yours?
    - If this, then _____.
    - We have all the time in the world to_____.
    - He can learn to _____any time/later.

Getting on the Same Page- Evidence-Based Assumptions

Getting on the Same Page

- If Assumptions Must Be Made, Try to Make Them Based on Evidence:
  - Good, quality studies with large numbers of children and clearly defined research protocols exist
  - Baseline and regular comprehensive assessments of a child must happen across time. Otherwise, how will we know what is happening with that child?

- http://www.agbell.org/Advocacy/Spoken-Language
- http://www.agbell.org/Advocacy/Cochlear-Implants-in-Children
- http://www.agbell.org/Advocacy/American-Sign-Language
- http://www.agbell.org/Advocacy/Communications-Access-Captioning

Listening and Spoken Language

- What is Listening and Spoken Language?
  - An approach to communication that involves use of specific strategies and techniques
  - A communication mode
  - An option/choice/decision

LSL from Start to Finish

- From auditory awareness to full-blown communicative competence

https://www.definitions.net/definition/Communicative%20competence

Communication Milestones
Birth-3 months

Hearing and Understanding

- Startles to loud sounds
- Quiets or smiles when spoken to
- Seems to recognize your voice and quiets if crying
- Increases or decreases sucking behavior in response to sound

www.agbell.org

Expressive/Talking

- Makes pleasure sounds (cooing, gooing)
- Cries differently for different needs
- Smiles when sees you

Communication Milestones
Ages 4 to 5 years

Hearing and Understanding

- Pays attention to a short story and answers simple questions about them
- Hears and understands most of what is said at home and in school

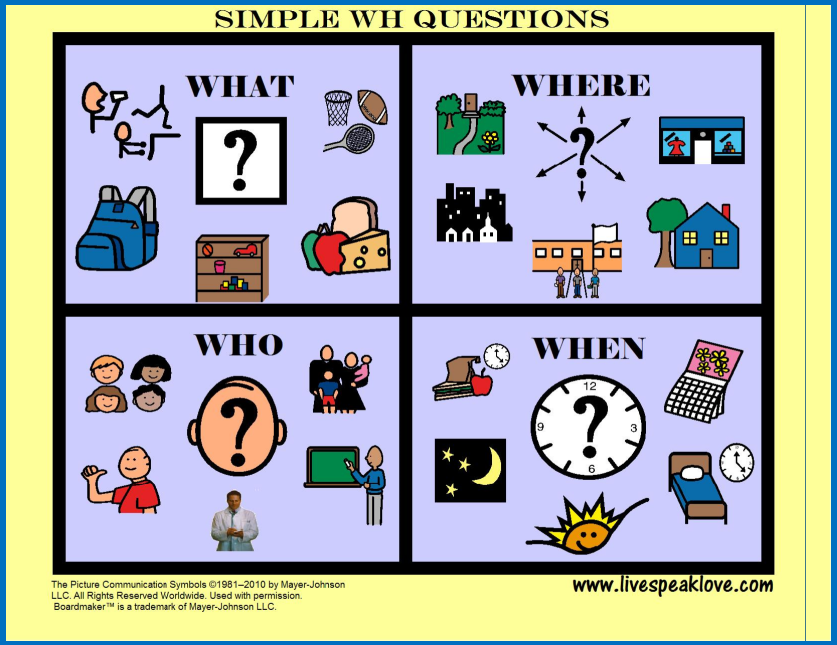
www.agbell.org

Expressive/Talking

- Uses sentences that give lots of details
- Tells stories that stick to topic
- Uses the same grammar as the rest of the family
- Communicates easily with other children and adults

Listening and Spoken Language

- Questions, Questions-Who, What, Where, When…. Why and How?



Wh-Questions Regarding Listening and Spoken Language

- Who? In Sessions-Parent/Caregiver-Child-LSL Professional
  In Life-the Whole Family and then some (e.g. childcare)
- What? Listening through Hearing and Using Verbal Speech/Language
- Where? At home, in the community, in special settings as needed (e.g. center-based environments)….everywhere
- When? (Early and Often) Individualized and determined by several factors including the child's age, an assessment that reveals a child's present levels of functioning *AND* as recommended by a professional who is a Listening and Spoken Language Specialist

Wh-Questions

- Why? From my professional and my parent perspective:
  - To develop communicative competence, a high level of literacy and the life skills that result from higher learning
  - To extend the family's (spoken) language, culture, history, and values to the child

What is the why for you?

Wh-Questions

- How? Attain and Sustain

1) Attain (develop) listening and spoken language by accessing the brain and doing so primarily through a child's sense of hearing in family-centered targeted intervention that is focused on bringing or returning child to a "typical" trajectory of development and is carried over into daily life within the context of the family and community

2) Sustain listening and spoken language ability and skills by monitoring and managing the child's hearing, access to hearing in a variety of listening environments, auditory devices, continued learning of (higher-level language), academic, social, emotional, personal development, and interpersonal skills

Video Clip (two siblings ages 18 and 15) Impacted by Newborn Hearing Screening

TRANSITION TO NEXT PRESENTER

Hearing Now: Creating a Neurological Context

Carol Flexer, PhD; CCC-A; LSLS Cert. AVT
Distinguished Professor Emeritus, Audiology
Northeast Ohio Au.D. Consortium (NOAC), and
The University of Akron
www.carolflexer.com

Carol Flexer, PhD, FAAA, CCC-A, LSLS Cert. AVT, is a Distinguished Professor Emeritus of Audiology, The University of Akron, and is an international lecturer and consultant in pediatric and educational audiology.

Financial Disclosure:
Carol's travel costs to this conference are being funded by the AG Bell Association.

Topics Discussed:

- What is the family's desired outcome?
- The world has changed!
- the relationship of the infant/child's brain neuroplasticity to the use of hearing aids, cochlear implants and wireless technologies
- A Model for Connecting the Dots: Promoting language, literacy and music for all children, based on the family's desired outcome

Always start conversations with The Critical Question: What is the Family's Desired Outcome?

- The family's desired outcome guides us – ethically and legally.
- What is your long term goal for your child?
- **How do you want to communicate with your child? What language(s) do you know?**
- Where do you want your child to be at age 3, 5, 14, 20? What does it take to get there?
- *95% of children with hearing loss are born to hearing and speaking families.*
- *Many families* use a main language at home other than the school language, so they likely are interested in their child speaking several languages.

So, let's create a context that presents the big picture for families who want a listening, spoken language, and literacy outcome for their children.

The world has changed

- How did we used to talk about hearing loss, and what did we believe to be true?
- We used to believe and talk about hearing as if we heard with the ear – now we know that is not the case. The meaning of hearing occurs in the brain.
- The world has changed for hearing healthcare; we are in a new era.
- Advances in knowledge about brain plasticity, auditory deprivation, and critical periods for language development have shifted the concentration of hearing management from the ear to the brain.

The world has changed

We have a new generation of children who are deaf or hard of hearing—a generation that is not only benefiting from advances in early hearing screening and the use of advanced hearing technology, but a generation that is also the beneficiary of what we now know about brain development, early childhood development, and language and literacy development.

Today's children experience a different context – a different ecology.

The Big Picture: The World Really Has Changed!

- *Who Moved my Cheese?* by Spencer Johnson, M.D. – a book about change
- We are an Information/Knowledge-based economy that demands high levels of spoken communication and literacy.
- We are educating children to take charge in the world of 2030, 2040, and 2050….not in the world of 1970 or 1990 or even 2020.

Spoken Communication: Past And Present

1. Audio clip of possible “oral” outcomes before early identification, early intervention, and cochlear implant technology
2. Video clip of possible “auditory-verbal – Listening and Spoken Language (LSL)” outcomes in this day and age

Audio Clip# 1 of possible “oral” outcomes before early identification, early intervention, and cochlear implant technology

Audio Clip# 2 of possible “oral” outcomes before early identification, early intervention, and cochlear implant technology

DVD of possible “auditory-verbal – Listening and Spoken Language (LSL)” outcomes in this day and age

The Excitement of Music!

Auditory Neurophysiology: What we now know

So, where to start?

Begin at the beginning

Making the connection between hearing loss, auditory neural deprivation, and use of hearing technologies -- and, how to explain this connections to families

Brain Clip

Brain Clip

Let’s begin with a Brief Summary of What We Now Know about the “Auditory Brain”

Sample of References for Brain Research

- Kral A. (2013). Auditory critical periods: a review from system's perspective. *Neuroscience,* 247: 117–33.
- Kral, A., Kronenberger, W. G., Pisoni, D. B., & O'Donoghue, G. M. (2016). Neurocognitive factors in sensory restoration of early deafness: A connectome model. *The Lancet Neurology*, *15*(6), 610-621.
- Kral, A., Lenarz, T. (2015). How the brain learns to listen: deafness and the bionic ear. *E-Neuroform*, 6(1):21-28.
- Kral, A., Sharma, A. (2012). Developmental neuroplasticity after cochlear implantation. *Trends in Neurosciences*, 35(2): 111-122.
- Kraus, N. (2018). Promoting sound health. *The Hearing Journal, 71*(11). 5.
- Moon, C., Lagercrantz, H., & Kuhl, P. K. (2013) Language experienced *in utero* affects vowel perception after birth: A two-country study. *Acta Pædiatrica, 102,*156-160.

References for Research about Outcomes

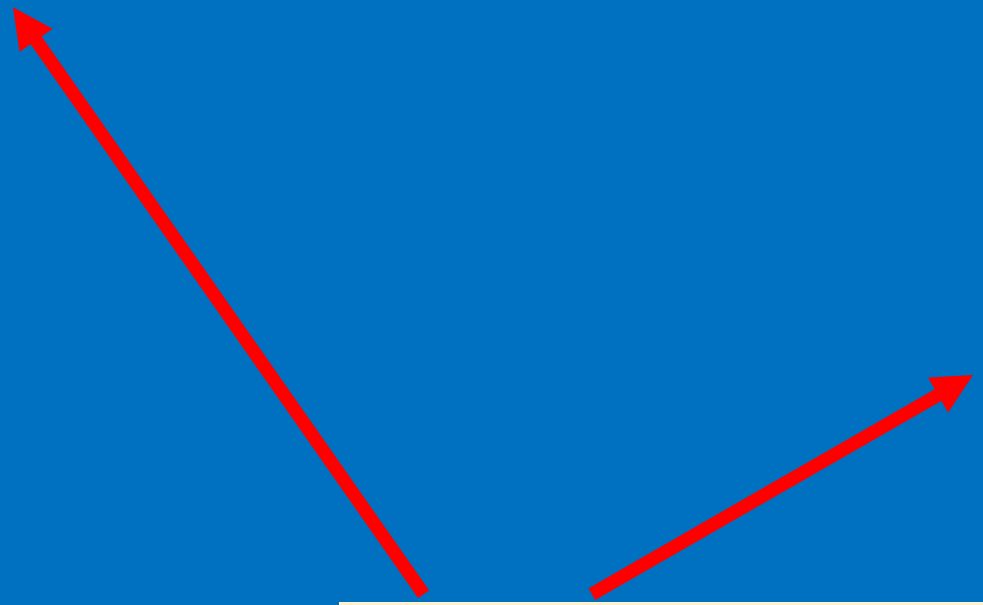
- Ching, T.Y.C., Dillon, H., Leigh, G., & Cupples. L. (2018). Learning from the longitudinal outcomes of children with hearing impairment (LOCHI) study: Summary of 5-year findings and implications. *International Journal of Audiology, 57*(S-2), S-105-S-111.
- Dettman, S.J., Dowell, R.C., Choo, D., Arnott, W., Abrahams, Y. et al. (2016). Long-term communication outcomes for children receiving cochlear implants younger than 12 months: a multicenter study. *Otology & Neurotology*, 37(2): e82-e95.
- Geers, A.E., Mitchell, C.M., Warner-Czyz, A., Wang, N.Y., Eisenberg, L.S., & the CDaCI Investigative Team. (2017). Early sign language exposure and cochlear implantation benefits. *Pediatrics, 140(1*). e20163489
- McCreery, R.W., Walker, E.A., Spratford, M., Bentler, R., Holte, L., Roush, P., Oleson, J., Van Buren, J., Moeller, M.P. (2015). Longitudinal Predictors of Aided Speech Audibility in Infants and Children, *Ear & Hearing*, 36, pp. 24S-37S.

Basic Science: (Kral et al, 2012; 2013; 2015; 2016)

- The results of Dr. Kral's studies (along with the research of others) suggest that when the brain does not have access to intelligible speech during the early months and years of a child's life, meaningful auditory input does not coordinate activity between primary and secondary auditory cortex.
- Instead, secondary auditory cortex assists with the processing of other functions such as visual processing.

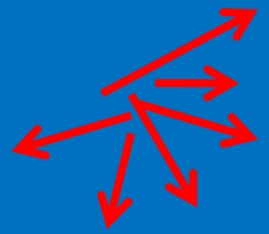
Primary Auditory Cortex

Primary Auditory Cortex

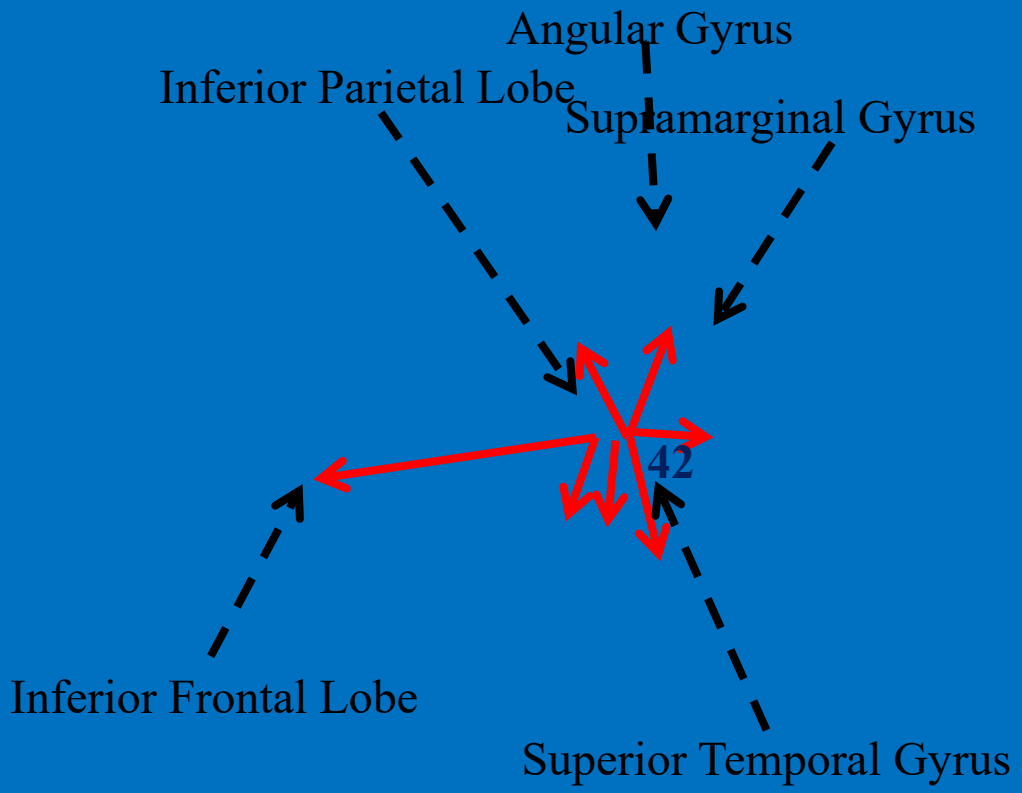


Primary Auditory Cortex

Secondary Auditory Cortex.



Secondary Auditory Cortex.



Kral et al…. Basic Science Continued

That is, when auditory signals are not efficiently and effectively transmitted from primary to secondary auditory cortex, the secondary cortex cannot distribute spoken language and other meaningful sounds/information to the rest of the brain to create auditory meaning and knowledge; *this negative process is called "downstream degradation"*.

Auditory System Complexity (Kraus, 2018)

- The auditory system has more relays connecting the sensory organ to the brain than other sensory systems.
- The auditory system contains some of the longest axonal tracts.
- Axonal tracts directionally link each of the auditory relays between the ear, brainstem, midbrain and cortex.

An illustration of the auditory portion of the human brain’s connectome.

Sound Processing Complexity (Kraus, 2018)

- Sound processing is one of the most computationally demanding tasks the nervous system has to perform.
- The task relies on the exquisite timing of the auditory system, which responds to input more than 1,000 times faster than the photoreceptors in the visual system.
- Humans can hear faster than they can see, taste, smell or feel.

The Challenge: How do we take our current knowledge of neuroplasticity and auditory deprivation, and use that information to create a brain context for managing hearing loss?

The Following slides describe a *Counseling Narrative*: Right from the start, explain complex information in a comprehensible fashion – offer the big picture!

Families often do not know what we are talking about…..define terms.

To Begin With: What is Sound? (Boothroyd, 2019)

- Sound is an “event” – not a label.
- For example, you don’t “hear” Mommy. You hear Mommy walking, talking, singing, tapping, dancing.
- An event creates vibrations.
- Vibrations are picked up by the “ear doorway” and are sent to the brain as energy for coding, and for perception as information.

What is Language?

- **Language is an organized system of communication used to share information.**
- It consists of sounds, words and grammar used to express inner thoughts and emotions.
- Language includes facial expressions, gestures, and body movements.

How Does Information Get into the Child's Brain?

Five senses capture environmental information and transform that information into neural impulses read by the brain:

- Hearing
- Sight
- Smell
- Taste
- Touch

For Example, the Nose is the “Doorway” to the Brain for the Sense of Smell – but, we smell with the *brain*.

Another example: The Eyes are the Doorway to the Brain for Visual Information.

But, we see with the brain – not the eyes.

The point: The Ear is the “Doorway” to the Brain for Sound -- Spoken Language/Information – Talking – Reading. We hear with the brain – not with the ears!

So, what is Hearing Loss? We can think about Hearing Loss as a "Doorway" Problem

- The ear is the "doorway to the brain" for sound.
- Hearing loss of any type and degree obstructs that doorway a little (hard of hearing),a lot (hard of hearing) or completely (deaf), preventing sound/auditory information from reaching the brain where the meaning of auditory information occurs.
- Hearing aids and cochlear implants break through the doorway to allow access, stimulation and development of auditory neural pathways.

The purpose of technologies (e.g. hearing aids, cochlear implants, remote wireless systems) is to get sound -- auditory language information -- through the doorway to the brain.
There is no other purpose!
The choice of technology depends on what is happening in the doorway.

An Audiogram is the way we measure the quantity and quality of the “Doorway” Problem

Well then, What is Hearing?

- **Hearing can be defined as *"brain perception of auditory information."***
- Hearing is a first-order event for the development of language -- spoken communication, literacy skills, and social-emotional connections.
- Anytime the word "hearing" is used, think "**auditory brain development**" using 1 billion neurons with a quadrillion connections!
- Acoustic accessibility of *intelligible* spoken language is essential for brain growth.
- **There are no "earlids" – the brain is available for auditory information 24/7.**
- Signal-to-Noise Ratio (SNR) is the key to hearing intelligible auditory information – speech must be 10 times louder than background sounds. Download SLM APP on iPhones or Tablets.
- ***Our early intervention programs and classrooms must take into consideration the child's brain access of acoustic information for language and for social growth.***

THE EAR

First display a picture of the “Brain Ear” and then the more traditional picture of the “doorway” ear, showing:

Outer (external), Middle and Inner Ear

It’s All About The Brain

Hearing loss is not about ears; it’s about the brain!

Hearing aids, RM systems and cochlear implants are not about ears; they are about getting auditory information to the brain!

They are “brain access tools”.

So, what Does “Deaf” Look Like in 2019?

- Does 2019 “Deaf” look like 1990 “Deaf”?
- We have used the same words for decades, but the context and possibilities have changed, dramatically!
- We can now talk about hard of hearing and deaf as descriptors of the status of the (ear) doorway.

***Therefore, we now know we must always consider*:**

What auditory information has reached and developed the brain, through the ear/doorway?
What is the status of the child's auditory brain?
Where has the brain been?
What does the brain "know"?
What is the Child's "Hearing Age"?

Putting it All Together – "The Logic Chain"

- The Logic Chain is a model that summarizes what we know, at this point in time, about the ingredients necessary to create a listening, speaking, and reading brain.
- The Logic Chain represents a system of foundational structures that must ALL be in place to optimize the attainment of a listening, spoken language and literacy outcome; no link can be skipped.
- Family-focused Listening and Spoken Language (LSL) intervention plays an integrated role – but not the only role.
- See Offer.HearingFirst.org/EHDI_Resources for the complete, research-based, document.

<u>The Logic Chain Model</u> – We now know all links must be evaluated and managed to create a SYSTEM for the attainment of a listening and spoken language outcome – if that is the outcome the family desires.

- **Brain Development >**
- **General Infant/Child Language Development in the Family's Home Language >**

- **Family-Focused LSL Early Intervention >**
- **LSL Early Intervention for Literacy Development**

Listening and Spoke Language (LSL) Development

How much parents converse with their child is the best predictor of the child's language competence, whether or not the child has a hearing loss.

Parents need to speak the language(s) they know.

Wear hearing technologies 10-12 hours per day. "Eyes open, technology on".

Connect the Dots between Hearing and Literacy

Listening is the Foundation of Reading

- It takes approximately 20,000 hours of listening to speech before a child's brain has clear mental referents for each of the speech sounds.
- This listening ability is necessary to enjoy rhyming and to develop phonological awareness skills.
- Reading is parasitic on listening.
- **The Goal is grade-level literacy by the end of third grade!**

Professionals -- Coach Families to Read, Read, Read to children!

Creating Neural Pathways for Reading: An Exercise in Plasticity, because Reading is not Natural

Why Read Aloud?

- Exposure to storybooks is the biggest factor in a preschooler's vocabulary.
- More parent-child conversations occur during read alouds than during any other activity.
- Children who receive read-alouds show gains of more than twice as many new words.
- Reading aloud to children before age 6 effects language, literacy and reading development.
- *Think about reading aloud as a conversation, not as a task to be completed.*
- You can never read too much!

Reading Clip – in NICU

To Summarize…..

- Hearing loss is a neuro-biological emergency, and we must act urgently to avoid auditory sensory deprivation*!*

- For families choosing a listening and spoken language (LSL) outcome for their children who are deaf or hard of hearing (status of the doorway), the appropriate hearing technologies for breaching that doorway must be fit and managed as soon as possible after birth by a pediatric audiologist.

Fitting hearing technologies is the first line of treatment for auditory sensory deprivation.

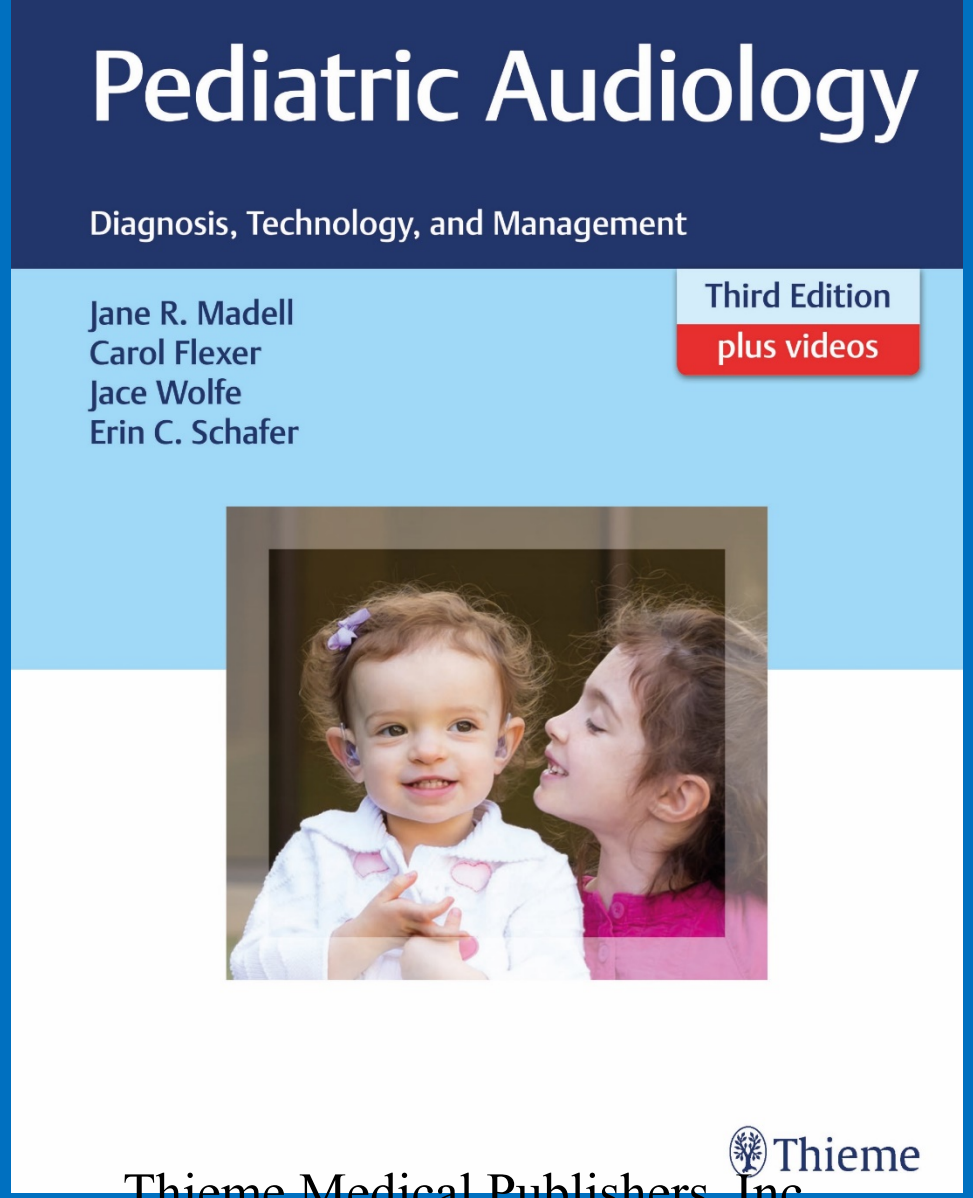
To Summarize….

- Brain access devices must be worn at least 10 hours per day, and families are encouraged to speak their home language, beginning in infancy. Use a remote microphone system at home as well as at school.

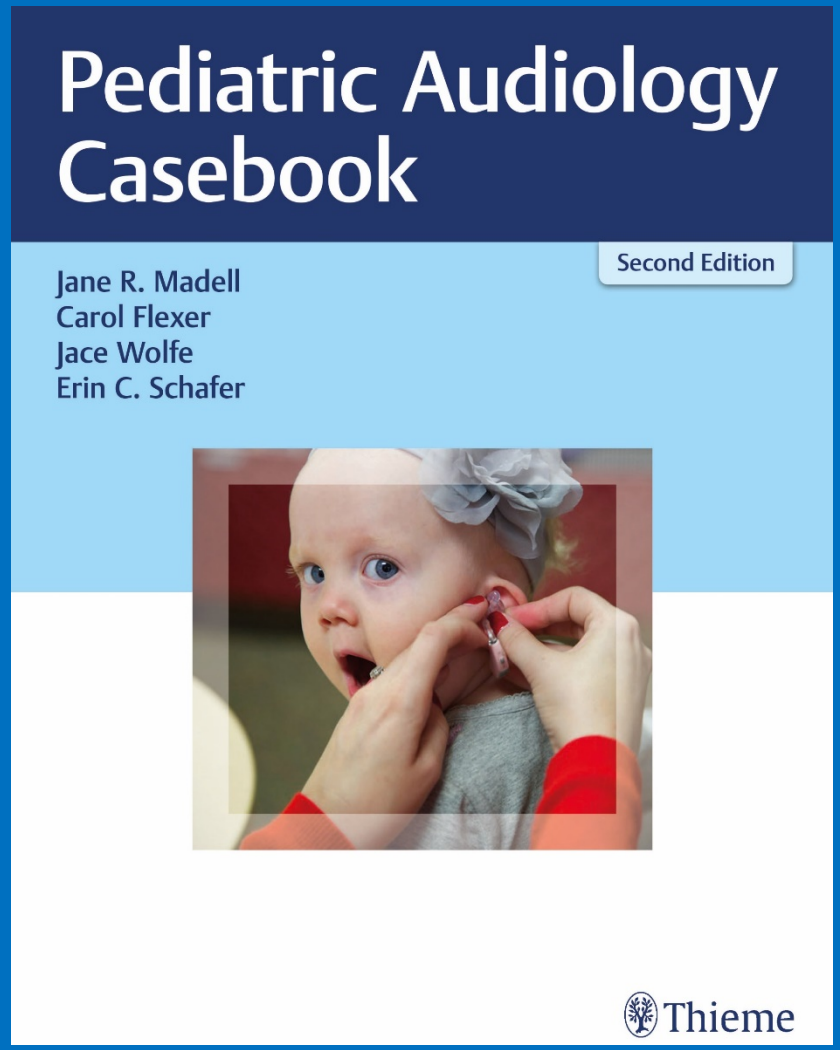
- Children need to be immersed in a conversation-enriched (talking, reading aloud, and musical) environment in order to grow their brain with knowledge for spoken language and literacy development. The neurological concept is, *“experience dependent plasticity”.*

General References

- Cole, E., & Flexer, C. (2016). *Children with Hearing Loss: Developing Listening and Talking, Birth to Six, 3rd ed.* San Diego: Plural Publishing.
- Madell, J., Flexer, C., Wolfe, J., & Schafer, E.C. (2019). *Pediatric Audiology: Diagnosis, Technology, and Management, 3rd ed.* New York: Thieme Medical Publishers.
- Madell, J., Flexer, C., Wolfe, J., & Schafer, E.C. (2019). *Pediatric Audiology Casebook, 2nd ed.* New York: Thieme Medical Publishers.
- Merzenich, M.M. (2010, April). *Brain plasticity-based therapeutics in an audiology practice*. Learning Lab presented at the American Academy of Audiology National Conference, San Diego.
- Robertson, L. (2014). *Literacy and Deafness: Listening and Spoken Language.* San Diego: Plural Publishing.



Thieme



Thieme Medical Publishers, Inc.
Order toll-free: 1-800-782-3488
Fax: 1-212-947-0108
www.thieme.com

Small Group Discussion

Communication Modes/Methods

Manual vs. “Oral”

Manual: ASL, MCE, Bi-Bi

Combined: Total Communication/TC & Cued Speech

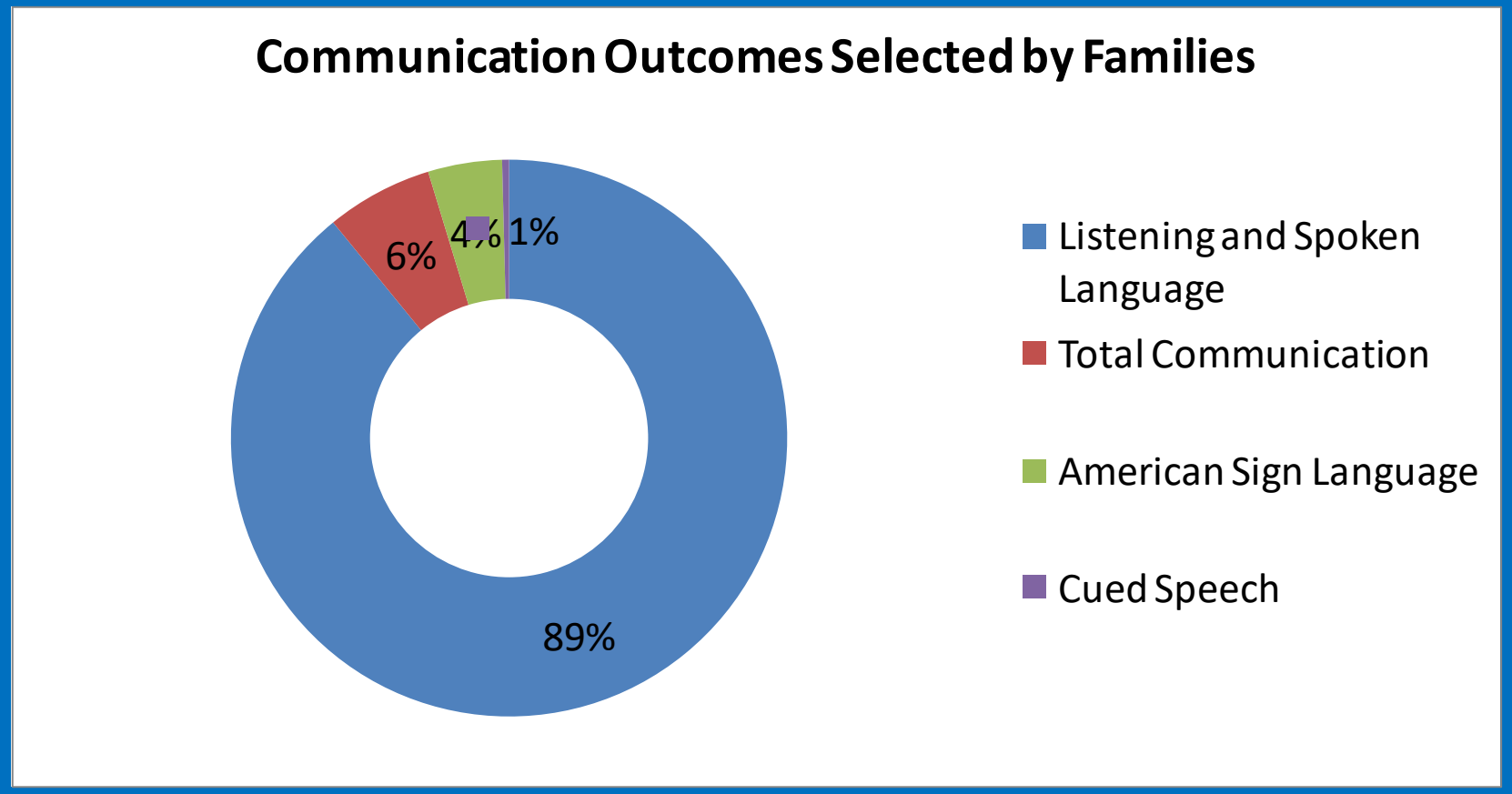
Listening and Spoken Language:

Auditory-Verbal (Acoupedics/Unisensory)

&

Auditory/Oral (with a history of reception via speechreading)

Family Choice:
Snapshot North Carolina



Source: BEGINNINGS of North Carolina is a non-profit agency providing an impartial approach to meeting the diverse needs of families with children who are deaf or hard of hearing and the professionals who serve them

DMG Disclosures

- Salary paid by The College of Wooster
- Paid Professional Staff Member of the Cleveland Clinic Foundation
- Board Member, AG Bell International
- Board Member, Joint Committee on Infant Hearing
  (AG Bell Association representative)

Board Member, Council on Education of the Deaf

(AG Bell Association representative)

Audiology: The Foundation of Listening & Spoken Language

The Ear

- Outer Ear
- Middle Ear
- Inner Ear
- “Beyond the Cochlea”

WE HEAR WITH OUR BRAIN –
The EAR is just the way IN!

Let’s talk about *HEARING!*

Outer Ear/Tympanic Membrane/Middle Ear

Pinna / Auricle; Ear Lobe; Concha (ear canal opening);
External Auditory Meatus / EA Canal
(beware of CERUMEN – ear wax)

T M – "border" between the OE and ME

Ossicles: Hammer/Malleus; Anvil/Incus; Stirrup/Stapes

- Eustachian Tube (connecting the Middle Ear Space and the Nasopharynx – back of the throat)

Middle Ear Space should be air-filled

OME- Otitis Media with Effusion/ME Fluid

Inner Ear

- Cochlea
  - Scala Vestibuli / with perilymph
  - Scala Media / with endolymph
  - Scala Tympani / with perilymph

- Semicircular Canals (Vestibular System / Balance)

Universal Newborn Hearing Screening (UNHS)

Audiometric Test Battery

- Otoscopy
  - visual inspection eardrum and ear canal
- Tympanometry
  - test of middle ear function
- Acoustic Reflex Thresholds
  (ipsilateral / same side contralateral / opposite side)
- Otoacoustic Emission (OAE) Test
  - test of outer hair cell function in inner ear (cochlea)
- Auditory Brainstem Response (ABR) Test
  - provides info about inner ear and brain pathways for hearing
- Behavioral Testing
  - method of testing varies by age of patient

Otoacoustic Emission (OAE) Testing

- Measurements obtained from ear canal with probe
- Records cochlear responses to acoustic stimuli
- Reflects status of peripheral auditory system extending to the cochlear outer hair cells
- Will NOT identify Auditory Neuropathy

OAEs – Pros & Cons

Pros of OAEs

- Frequency-specific
- Present at birth
- Infant can be awake for testing

Cons of OAEs

- Only provides info about OHC status
- Requires normal middle ear function
- Response altered by ambient noise
- Does not indicate degree of hearing loss

Auditory Brainstem Response (ABR) Testing

- Measurements obtained from surface electrodes
- Records neural activity in cochlea, auditory nerve, and brainstem in response to auditory stimuli
- Reflects status of peripheral auditory system, 8th nerve, and brainstem auditory pathway
- Will identify Auditory Neuropathy

ABR – Pros & Cons

Pros of ABR

- Indicates degree of hearing loss
- Assesses greater area of the auditory pathway
- Various stimuli options

Cons of ABR

- Assesses only synchronous neural function
- Infant must be asleep for testing

UNHS

- Not all children are screened
- Some children are born at home – Train the midwives!
- Need to be sensitive to screen non-documented and other family's wee-ones
- Many U.S. programs only test with OAEs and likely miss ANSD (ideally need 2-test models--ABR & OAE tests)
- Some hearing losses will be progressive
- Disease processes occur in the first months of life and are therefore missed at birth
- Hearing losses can be acquired

JCIH Statement Principles (2000/2007)

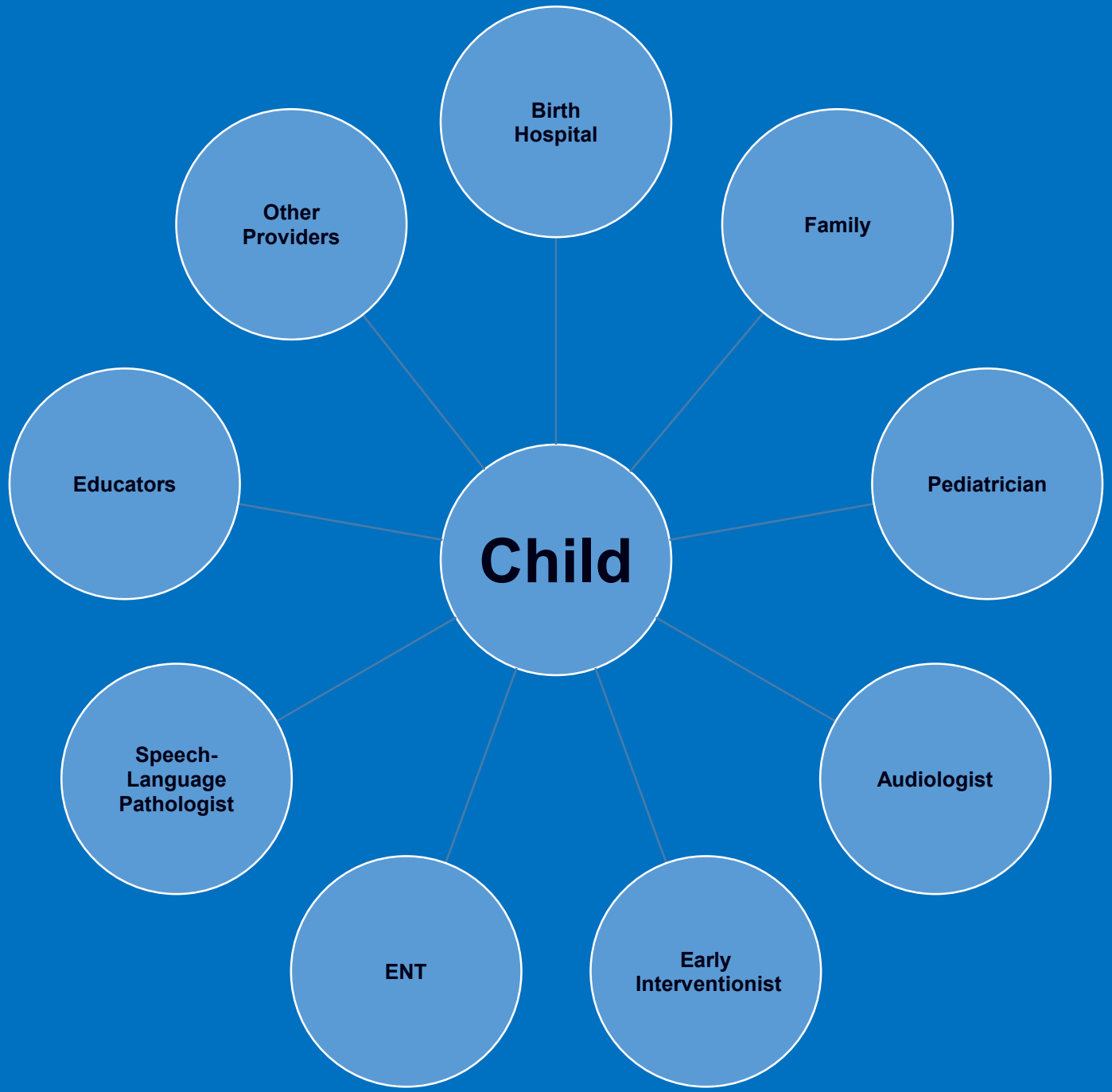
1. All infants should have access to hearing screen by **1 month of age**

2. All infants who do not pass the initial screen and subsequent re-screen should have audiological confirmation of hearing loss by **3 months of age**

3. All infants with confirmed hearing loss should receive intervention services by **6 months of age**

   [Intervention refers to both fitting of Technology AND Early Intervention services from a "Qualified Provider"]

What Happens Next?


Birth Hospital
Other Providers
Family
Educators
Child
Pediatrician
Speech-Language Pathologist
Audiologist
ENT
Early Interventionist

Behavioral Testing

- Conventional Audiometry
  - ~ age 5 years*& beyond!
- Conditioned Play Audiometry
  - ~ age 2-5 years*
- Visual Reinforcement Audiometry
  - ~ age 6 months-2 years*
- Behavioral Observation Audiometry
  - ~ below 6months*

**refers to developmental age of patient*

When “Things” Go Wrong

- Outer Ear Disorders
- Middle Ear Disorders
- Inner Ear Disorders

Cochlea / Sensory problems

Beyond the Cochlea / Neural problems

TYPES of Hearing Loss

- Conductive Hearing Loss (affects the OE &/or the ME)
- Sensori-Neural Hearing Loss / SNHL
  (affects the IE &/or cranial nerve viii/the auditory nerve)
- Mixed Hearing Loss (combination of Conductive HL & SNHL)

(+ Non-Organic HL)

[+ (Central) Auditory Processing Disorders]

Audiogram

- Graphic representation of the hearing testing results
- X axis / Across the horizon / *abscissa*; the Frequency range; on the top left – low pitch; to mid pitch; and to the top right – higher pitches
- Y axis / up/down / *ordinate*; the intensity in dB HL range – top of the audiogram “soft” sounds; down the audiogram towards the bottom – “loud” sounds

Audiogram

- Red symbols for RE
- Blue symbols for LE
- NO Response (NR) arrow angled downward

Types of Hearing Loss from the Audiogram

- Within Normal Limits (WNL)
- Conductive Hearing Loss (Air-Bone Gap/ABG exists); BC thresholds are WNL and AC thresholds are abnormal/poor
- Sensorineural Hearing Loss (SNHL) – AC and BC thresholds are similarly abnormal/poor
- Mixed Hearing Loss: an ABG exists, the BC thresholds are poor and the AC thresholds are even worse (hence the ABG)

Audiograms

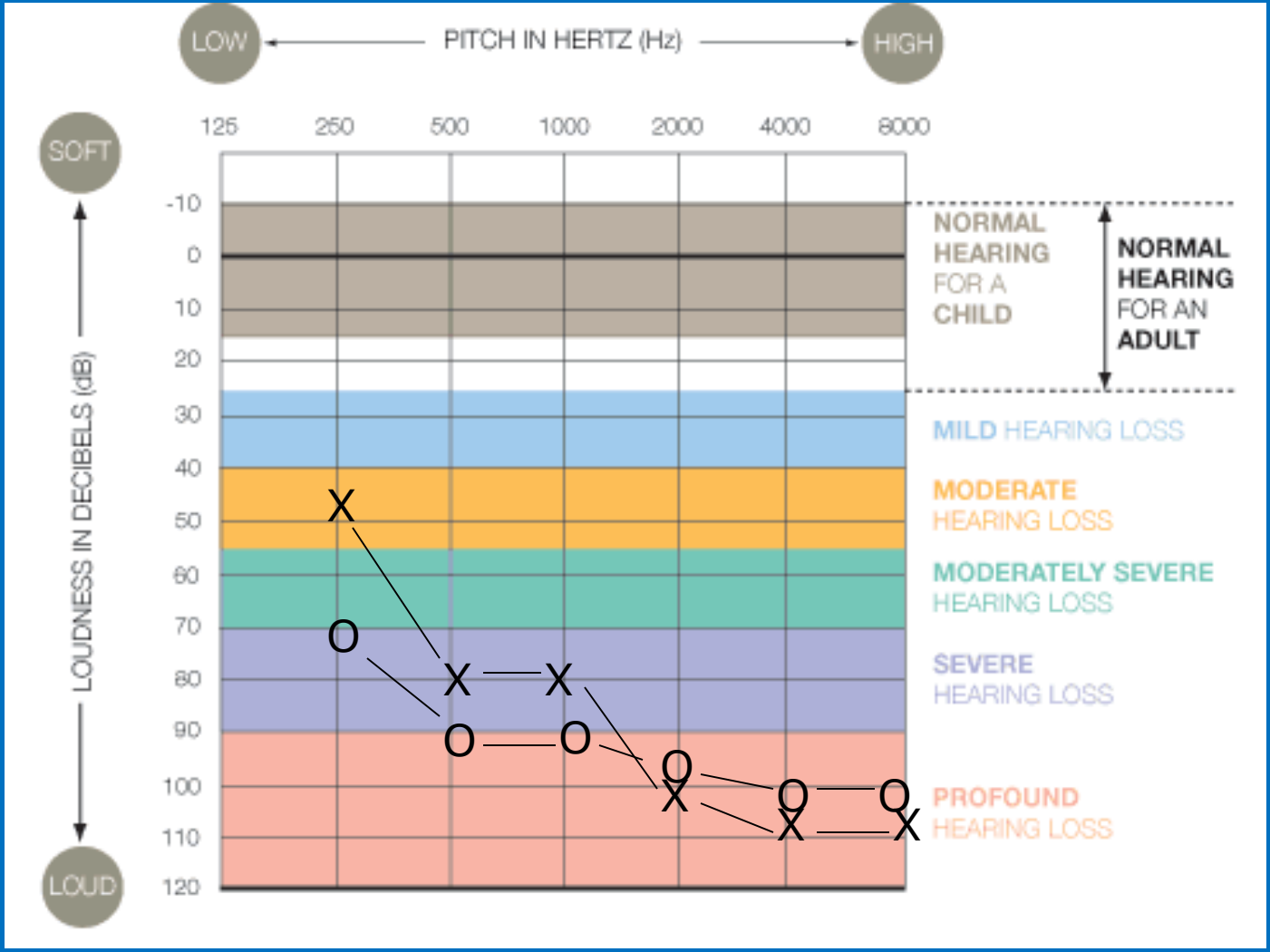


Image from League for the Hard of Hearing

Hearing Loss

Does NOT Equal

Auditory Function

Other Auditory Measures

A variety of Speech Audiometric & Speech Perception measures may be completed

- Speech Recognition Threshold (**SRT**) Stimuli: spondee words – assesses low frequency hearing/especially vowel info.

- Word Recognition / Word Identification
- (closed set-picture pointing; or open set-repeat back procedures) Stimuli: PB words – more typically assesses higher frequency/ consonant sounds

Speech Perception/Other Measures

Word Recognition:

* ESP (Pattern Perception plus)
  - NU-CHIPS
  - WIPI
  - PBK-50

Early Speech Perception (ESP) (Moog & Geers, 1990)

(Moog & Geers, 1990)

NU-CHIPS

Speech Perception/Other Measures

Parent Report/Judgments & Pediatric Tools:

- Infant Toddler Meaningful Auditory Integration Scale (IT-MAIS)
- Meaningful Auditory Integration Scale (MAIS)

- Parents' Evaluation of Aural/Oral Performance of Children (PEACH)

- Mr. Potato Head, Pediatric Az, Baby Bio, MLNT, LNT, Checklist of Auditory Communication Skills, LittlEars, PLUS!

Speech Perception/Other Measures

Teacher Report/Judgments:

- Teachers Evaluation of Aural Performance of Children (TEACH)
- SIFTER/s (Preschool, School-Age, Secondary)
- Listening Inventory for Education (LIFE) (Student Appraisal / Teacher Appraisal)
- Functional Listening Evaluation
- Functional Auditory Performance Indicators (FAPI)

More Team Members

- Audiologists
  - Diagnostic (Auditory Electrophysiologist, Pediatric specialization)
  - Dispensing Audiologist
  - Cochlear Implant Audiologist
  - (Re) Habilitative Audiologist
  - Educational Audiologist

GOAL

AUDITORY *ACCESS*!

to lead to

***BRAIN* ACCESS !!!**

Winning Combination

Appropriate Technology & Auditory Access

PLUS

Enriched Auditory Exposure

=

AUDITORY BRAIN DEVELOPMENT

(Dunn & Holcomb, 2019)

Hearing Sensory Technology

- Hearing Aids

* Remote Microphone (RM) Technology

* Other Hearing Assistive Technology

* HAT: Listening / * HAT: Alerting Devices

* Cochlear Implants

* Auditory Brainstem Implants

* Auditory Osseo-integrated Systems

(not correctly referred to as “Bone Anchored Hearing Aids,” but specifically -- Ponto by Oticon and “Baha” by Cochlear Americas)

Hearing Technology Worn Throughout the Child's Waking Hours

“Technology Retention”: Consider Trying

- www.hearinghenry.com
- #1 -- EAR GEAR – Spandex sleeve slips over hearing devices. Has stretch cord and plastic locking clip. **www.gearforears.com**
- Oto/Critter Clips **www.westone.com**
- **JoyBandsLLC.com**
- www. Silkawear.com
- Ciwear.com
- Frogglez – “No Hazzle Swim Goggles www.thegromet.com

www.hannaandersson.com (BEWARE of covering the mic)

Remote Microphone Technology (RM/FM/s/IR) – **NON-NEGOTIABLE!**

Signal-to-Noise Ratio (SNR)

Relationship of the intensity of the speech / instructor's signal to the intensity of the unwanted signal (noise)

Should be a positive number

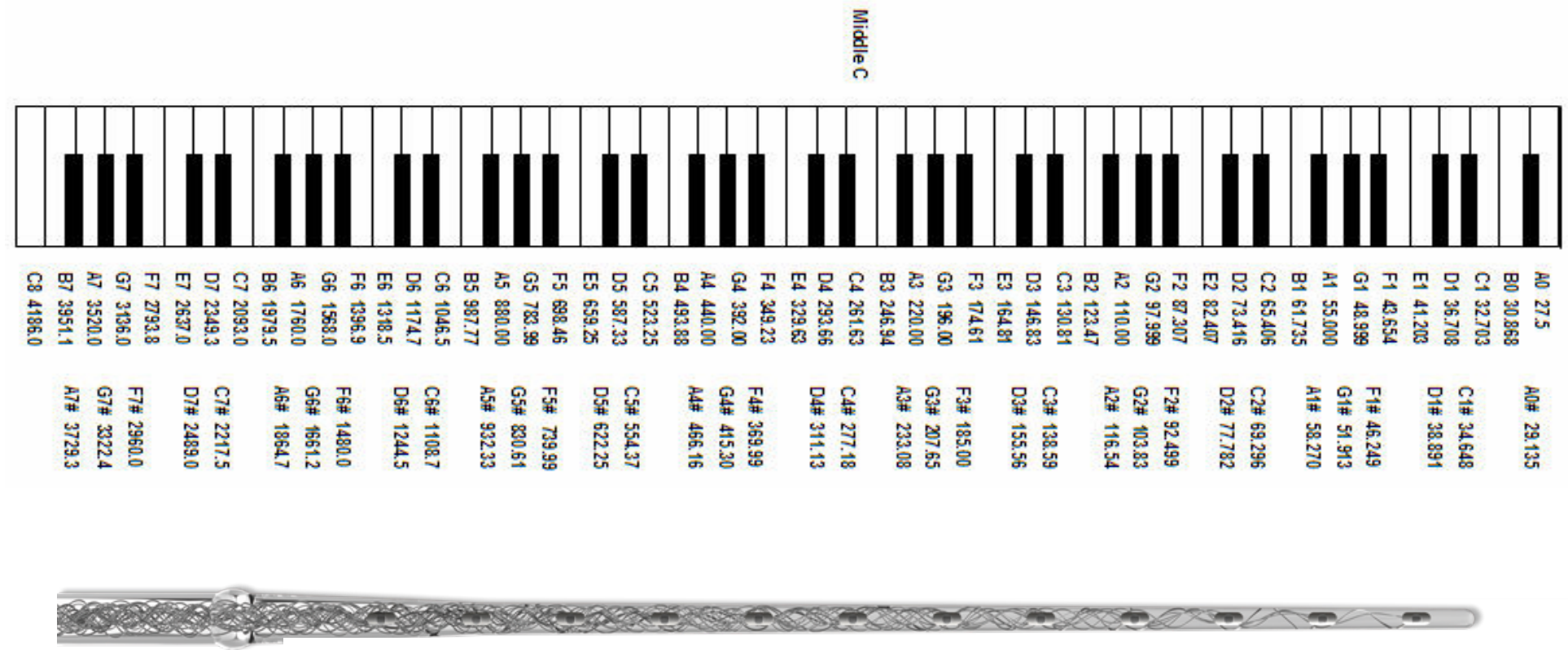
(+15 to +25)

(Gates, 2003, p. 423)

When to REALLY Refer for CI Evaluation

Frequency via Electrode Placement

Electrodes on the implant are arranged by frequency (pitch)



High Mid Low

Hearing Happens in the Brain!

AG Bell “Audiologic” Protocol

Alexander Graham Bell Association’s Recommended Protocol for Audiological Assessment, Hearing Aid and Cochlear Implant Evaluation, and Follow-Up (2014)

AG Bell Protocol Components

Overview of Audiological Management:

* 1-3-6 (JCIH)
* Recommendation of frequent evaluation

Questions for Good/Better/ "Best"

- Pediatric Expertise?
- "Aggressive" Testing Schedule?
- Is it the case that "Every dB counts/matters"?
- Is Parent/Clinician/Educators Input Critical?

AG Bell Protocol Components

Recommended Elements of the Initial Audiological Diagnostic Assessment:

* Comprehensive Audiological Evaluation

(Birth to Age 6 Months; Age 6 to 36 Months)

* Reports/Audiograms/Referrals

Audiology Recommendations

Because – every dB counts!

Unaided Testing

Right Ear

Left Ear

Aided Testing

Binaural

Right HA

Left HA

CI/HA Testing

CI-Only

CI & HA

HA-Only (if possible)

Bilateral CIs

Both CIs

Right CI-Only

Left CI-Only

Birth to Age 6 Months

* Otoscopic Inspection

* Child and Family History

• ABR (click versus tone pips) (replicate waveforms?)

(reverse polarity?)

* Auditory Steady State Response (as appropriate)

* OAE (as appropriate)

* Tympanometry (Wide Band Reflectance)

* Parent and Clinician Input/Observations
(Auditory Behavior, “Overall” Development)

Age 6 Months to 36 Months

* Otoscopic Inspection
* Child and Family History
* Parental Report of Auditory/Visual/Communication Behaviors and Milestones
* Behavioral Audiometry
* Speech Detection/Speech Recognition Threshold/Word Recognition/Speech Perception
* Acoustic Immittance/Tympanometry and AR Thresholds
* OAE testing (as appropriate)
* Electrophysiological Testing (as appropriate)

Other Elements/Questions for Good / Better / "Best"

Do the Parents understand the results?

Do the Parents understand the management plan?

What are the follow-up plan/schedule?

Are parent questionnaires used – IT-MAIS, LittlEars?

Audiogram and Report available? Understandable?

Was the testing RELIABILITY noted?

Copies to other providers?

Referrals to other professionals? (pediatrics, ENT, genetics, social services, psychology/counseling, OT, PT, others?)

AG Bell Protocol Components

<u>Recommended Procedures to Assess Amplication</u>:

- Electroacoustic Analysis
- Real-Ear-to-Coupler Differences (RECD) Measures
- Cortical Auditory-Evoked Response Testing
- Sound Field “Aided” Testing

(soft/~35 dB HL; conversational speech intensity/~45/50 dB HL)

(testing in Quiet and at varying SNR/s / testing in noise)

AG Bell Protocol Components

Recommended Audiological Management for Children with CI/s

AG Bell Protocol Components

Recommended Audiologic Management Regarding FM Systems

AG Bell Protocol Components

RECOMMENDED ASSESSMENT PROTOCOLS – By Age of Child (0-6 months, 6-12 months, 12-24 months, 24-36 months, Over 36 months)

Electrophysiologic Testing (ABR, OAE, ASSR)
Immittance Testing
Behavioral Testing
Speech Perception Testing (Includes Recommended Speech Test Protocols by Age)
Testing With Technology
Hearing Aid / CI / Bimodal / RM-FM Testing

Hearing and Auditory Experience Matter!

Brief History of Auditory Teaching

- Victor Urbantschitsch (1895)
- Max Goldstein/CID (1939)
- Emil Froeschels
- Helen Beebe & Doreen Pollack
- Daniel Ling / Agnes Ling Phillips
- Many others to follow!

Helen Hulick Beebe

Auditory-
Verbal
Pioneer

Video

Helen Hulick Beebe
(circa 1988)

Doreen Pollack
A-V Pioneer

Book

- Educational Audiology For The Limited- Hearing Infant And Preschooler: An Auditory-Verbal Program D. Pollack, D. Goldberg, & N. Caleffe-Schenck

Give back to parents their natural role as their child's first and most important teacher

(adapted from Pollack, 1970)

It’s ALL About Communication!

Auditory Teaching / Auditory Learning

DMG: Avoid the term "Auditory TRAINING"

Recommendation//Consider instead –

Auditory Teaching / **Auditory Learning**

Principles of A-V Therapy Practice

(AG Bell Academy for Listening and Spoken Language, 2009)

1. Early diagnosis, audiologic management, and AVT.
2. State-of-the-art **hearing technology** to obtain maximum auditory stimulation.
3. Guide and coach parents to help their child **use hearing as the primary sensory modality** in developing listening and spoken language.

Principles of A-V Practice

4. Guide and coach **parents as primary facilitators** of child's listening and spoken language development through active consistent participation in individualized AVT.
5. Guide and coach parents to create environments that support **listening throughout the child's daily activities**.

Principles of A-V Practice

6. Guide and coach parents to help **integrate listening and spoken language into all aspects of the child's life**.

7. Guide and coach parents to **use natural developmental patterns** …

8. Guide and coach parents to help their child **self-monitor** spoken language through listening.

Principles of A-V Practice

9. Administer on-going formal and informal diagnostic assessments to develop individualized A-V treatment plans – **diagnostic therapy** – to evaluate clinical effectiveness

<u>&</u>

10. Promote education in "regular" **classrooms with peers with "typical" hearing** and *with appropriate support services* from <u>early childhood</u> onwards.

Principles of A-V Practice

Above PRINCIPLES were adapted from Pollack (1970)

- An A-V Practice requires **all** 10 principles to be in place.

- "Parents" also includes other caregivers who interact with the child.

FOUNDATIONS OF AUDITORY TEACHING

Auditory Teaching Techniques

- Emphasize LISTENING
- "Prompt "Listen"
- 1-on-1 Time
- Parents are Partners
- "Hand Cue"
- Use Acoustic Highlighting
- Integrate speech/auditory learning & language goals
- Use "Pause Time"
- Use Conversational Turn-Taking
- "Role reversal"
- Keep High expectations

Auditory Teaching Techniques

- Pay Attention to Acoustics
- Keep AUDIOLOGIC MANAGEMENT – "key" priority
- Beware of Repetition
- Use "Sabotage"
- Listening Age/Hearing Age
- Use Cognitive-Based Activities
- *"Teach Don't Test"*
- *"Put It Back Into Hearing"*
- Follow an AUDITORY Levels of Functioning

Auditory-Based Teaching Does **NOT** Merely Mean
Putting An Acoustic Hoop In Front of Your Mouth!

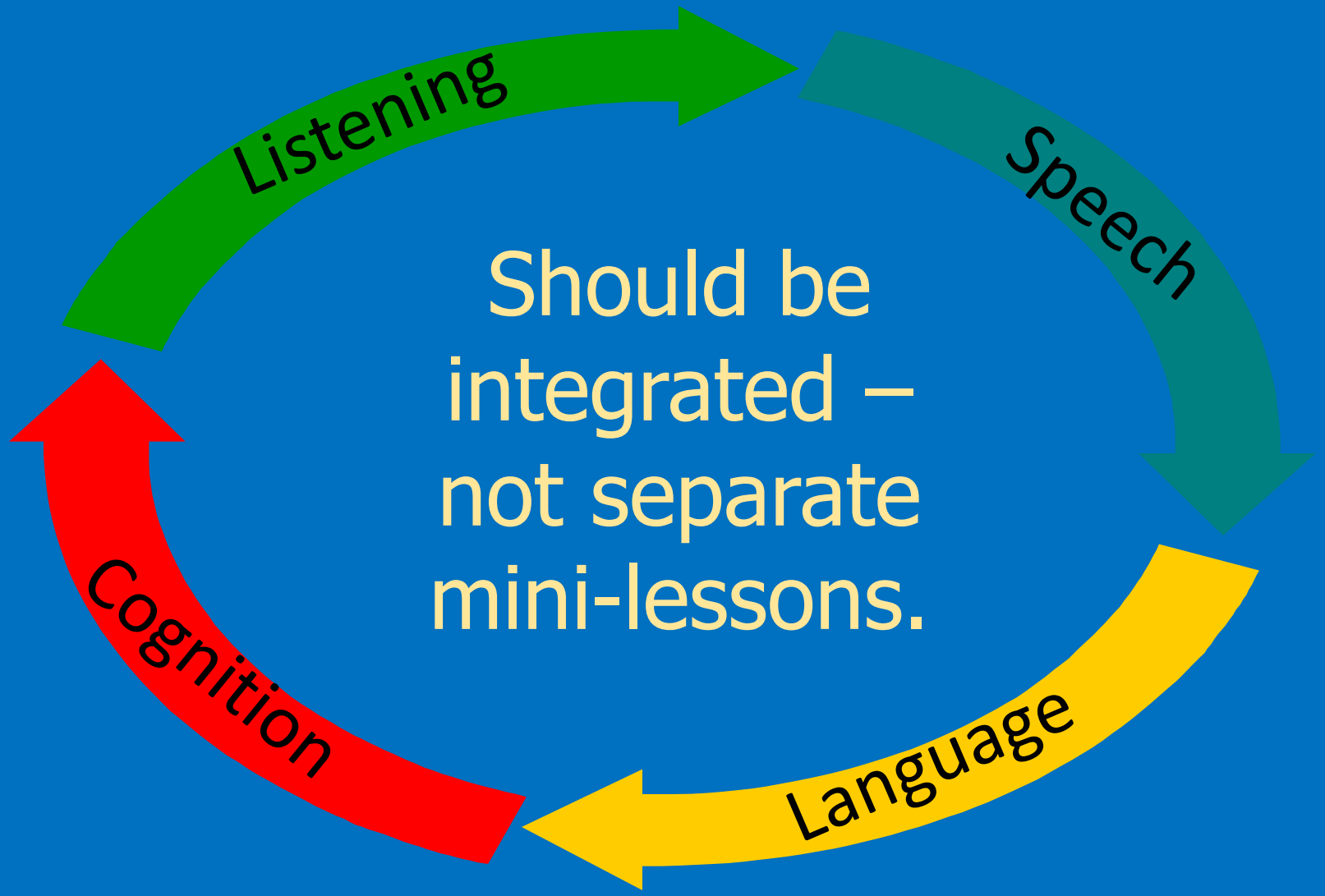
Use of Technology Throughout All Waking Hours

KEY:
Parents as partners and case managers

Pay Attention to Acoustics

- Positioning in therapy lessons
- Use of RM systems
- Use Acoustic modifications
- Know your "speech acoustics"

Interplay of Targets



Major technique:

Careful attention to the Patient's "Levels of Auditory Functioning"

An Auditory "Hierarchy" *

Levels of Auditory Functioning – My How Far We Have Come!

Comprehension:
Is there meaning to this sound?

Recognition/Identification:
Is this sound distinct from other sounds?

Discrimination:
Is this sound different from other sound?

Detection:
Was there a sound?

Daniel Ling

Ling Six (Seven) Sound Test

ah (/a/)
oo (/u/)
ee (/i/)
sh
s
m

(Ling & Ling, 1978)

Consider
"NO SOUND"
as the
7th Sound

(Rosemarie Drous,
Formerly of the
Helen Beebe Speech & Hearing Center)

Ling Six Sound Test

Distance for Detection/Identification

Sound	1’	3’	6’	9’	12’
/u/ oo					
/a/ ah					
/i/ ee					
/ ʃ/ sh					
/s/ ss					
/m/ mm					

Quick Check – Is the HA/FM/CI Working??? – Ling Sounds

- Present auditorily
- Mix up the sounds
- Tell the parents/audiologist which sounds are not being heard?
- Verify in “ALL” Conditions
- Consider: Enhanced communication from CI Centers to Schools & Schools to CI Centers

"Sample" Auditory Dx Battery

- Youngest: Ling 6, ESP, IT-MAIS, PEACH
- Preschool: Ling 6, ESP, IT-MAIS, GASP!, TAC
- Older: Ling 6, ESP, GASP!, TAC, Listening Comprehension Test-2, SIFTER

Assessment of Speech/Speech Intelligibility

- “Typical” Speech Sound Development

Assessment of Language

Receptive / Expressive Language

Form
(Morphology, Syntax, Phonology)
Content
(Semantics / Semantic Relationships
Use
(Pragmatics)

Language Assessment

Evaluate
FORM/CONTENT/USE
at both the *receptive* &
expressive levels

Use “typical” language
assessment tools
normed on “hearing”
clients

OTHER PROBES

Case History

Family Information

Object Permanence

Cause & Effect

Consider: Ireton/Minnesota; MacArthur-Bates; REEL-3; among others.

Transfer: Test Data to Intervention Goals/Objectives

- Use “tests” that assist you in developing intervention
- Be hierarchical
- Vary field size (closed/open set; # in set)
- Be functional
- Have fun! (otherwise – Why bother?)

Data Collection

- “Interventionists” should be keeping data.
- What outcomes are being measured/ monitored?
- Both “informal” and “formal” measurements are needed.

Measure/Monitor:

- LISTENING SKILLS / AUDITORY DEVELOPMENT
- SPEECH SOUND REPERTOIRE / SPEECH INTELLIGIBILITY
- RECEPTIVE LANGUAGE / COMPREHENSION
- EXPRESSIVE LANGUAGE

Data Collection

- **Measure** skills frequently
- Complete **longitudinal recordings/sampling**
- Use "**formal**" **diagnostic measures** addressing AUDITORY, SPEECH, LANGUAGE, & COGNITION
- Use "**informal**" **diagnostic tools**
- Continually **assess the PARENTS**, as well as the KIDDO who is deaf or hard of hearing!

Are We On Course?

- Overall – What is the Auditory-Speech-Language Progress ?

- Some other specifics:
  - Wear time of CI/s?
  - Progression through auditory hierarchy (basic awareness of sound to Ling Sound detection to Ling Sound recognition/identification, Learning to Listen sound associations, etc.)?
  - Increases and changes in speech sound production?
  - Receptive/Expressive language growth?

Are We On Course?

Typical Benchmarks:

- "Flat" serial audiograms in the "mild" hearing loss range
- Improving speech perception measures (closed to open set; quiet to noise)
- Closing the auditory-speech-language "gap"
- Approximately 1 years growth in 1 years time

See Loud & Clear! – "Clinical Red Flags"
Amy McConkey Robbins (2005)

Regan

Charlie

Ella

Henry

James

Jace

Nathaniel

Video

Which “tween” was born with a bilateral, profound sensori-neural hearing loss?

Girl on the Left or Right???

By Regan Brady

Listening to the Waves: Life with Cochlear Implants

www.listeningtothewaves.com

The Sky Is *Truly* The Limit!

Knowledge and Skills of LSL Specialists

Professionals and Listening and Spoken Language

1. Professional Education and Experience Requirements
   https://agbellacademy.org/certification/become-a-lsl-specialist/
2. Principles of Listening and Spoken Language Specialists
   https://agbellacademy.org/certification/principles-of-lsl-specialists/
3. Domains of Knowledge
   https://agbellacademy.org/certification/lsls-domains-of-knowledge/
4. Specific Skills and Knowledge
   https://agbellacademy.org/wp-content/uploads/2018/12/LSLS-Certification-Exam-Blueprint_FINAL.pdf

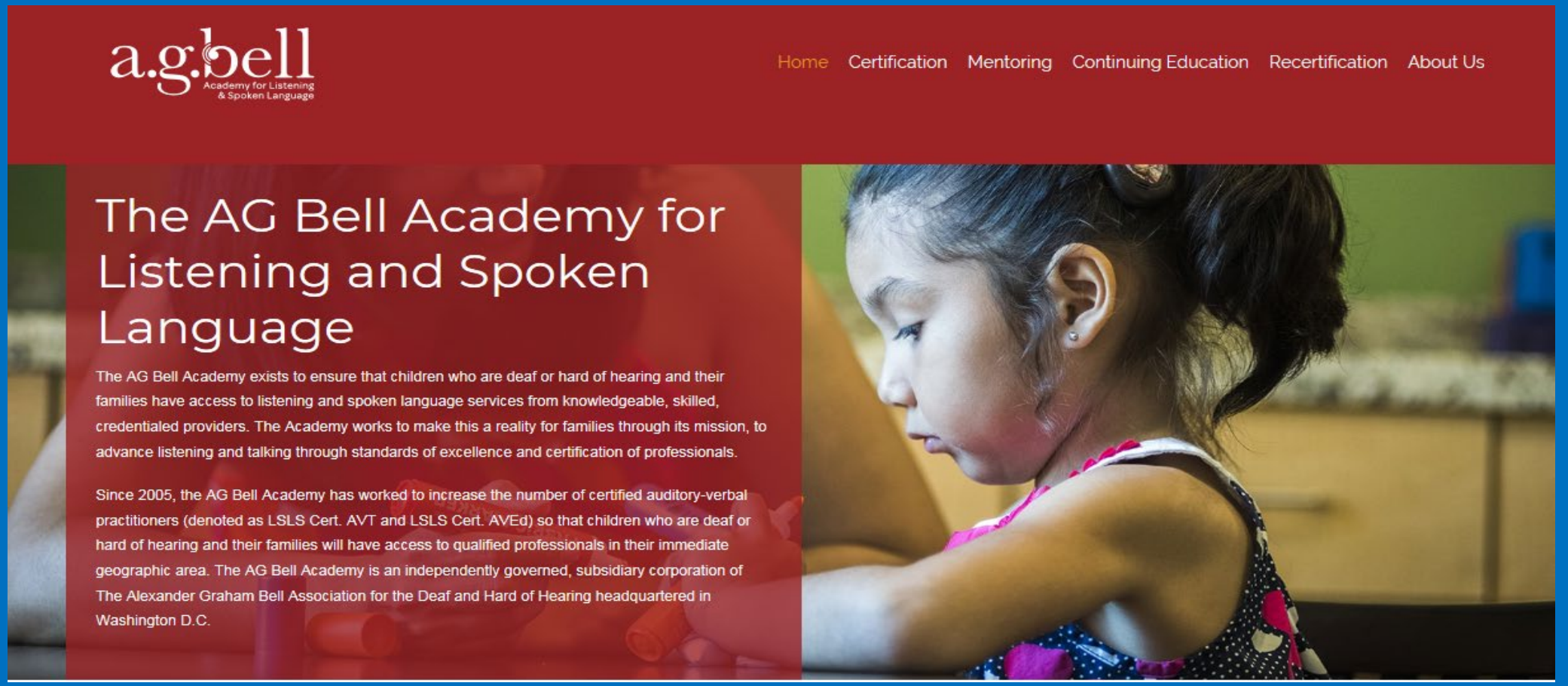
The Listening and Spoken Language Specialist

1. Eligibility to take the LSLS Certification Examination (LSLS Cert. AVT, LSLS Cert. AVEd)
2. Principles of Listening and Spoken Language Specialists
3. Nine Domains of Knowledge
4. 160 Knowledge and Skills Statement

www.agbellacademy.org

a.g.bell Academy for Listening & Spoken Language

AG Bell Academy for Listening and Spoken Language



Principles of LSL Specialist Auditory-Verbal Education (LSLS Cert. AVEd)

- A Listening and Spoken Language Educator (LSLS Cert. AVEd) teaches children with hearing loss to listen and talk exclusively though listening and spoken language instruction.
- Promote early diagnosis of hearing loss in infants, toddlers, and young children, followed by immediate audiologic assessment and use of appropriate state of the art hearing technology to ensure maximum benefits of auditory stimulation.
- Promote immediate audiologic management and development of listening and spoken language for children as their primary mode of communication.
- Create and maintain acoustically controlled environments that support listening and talking for the acquisition of spoken language throughout the child's daily activities.
- Guide and coach parents to become effective facilitators of their child's listening and spoken language development in all aspects of the child's life.
- Provide effective teaching with families and children in settings such as homes, classrooms, therapy rooms, hospitals, or clinics.
- Provide focused and individualized instruction to the child through lesson plans and classroom activities while maximizing listening and spoken language.
- Collaborate with parents and professionals to develop goals, objectives, and strategies for achieving the natural developmental patterns of audition, speech, language, cognition, and communication.
- Promote each child's ability to self-monitor spoken language through listening.
- Use diagnostic assessments to develop individualized objectives, to monitor progress, and to evaluate the effectiveness of the teaching activities.
- Promote education in regular classrooms with peers who have typical hearing, as early as possible, when the child has the skills to do so successfully.
- *(Adapted from the Principles originally developed by Doreen Pollack, 1970)*
  Adopted by the AG Bell Academy for Listening and Spoken Language®, July 26, 2007.

a.g.bell
Academy for Listening & Spoken Language

LSLS Domains of Knowledge

a.g.bell
Academy for Listening & Spoken Language

Knowledge and Skills Statements

- 160 Knowledge and Skills Statements
- https://agbellacademy.org/wp-content/uploads/2018/12/LSLS-Certification-Exam-Blueprint_FINAL.pdf

a.g.bell Academy for Listening & Spoken Language

Small Group Discussion

About Early Hearing Detection and Intervention
EHDI Components

Newborn Hearing Screening
Early Childhood Hearing Screening
Diagnostic Audiology
Early Intervention
Family Support and Partnership
Medical Home
Data Management
Financing and Reimbursement
Program Evaluation

http://www.infanthearing.org/components/

EHDI Components: How Does LSL Fit?

Newborn Hearing Screening
Early Childhood Hearing Screening
Diagnostic Audiology
Early Intervention
Family Support and Partnership
Medical Home
Data Management
Financing and Reimbursement
Program Evaluation

http://www.infanthearing.org/components/

Federal Government Resources

- Centers for Disease Control and Prevention (CDC) https://www.cdc.gov/ncbddd/hearingloss/links.html
- Health Resources & Services Administration (HRSA) Maternal and Child Health Bureau (MCHB)

  https://www.hrsa.gov/about/organization/bureaus/mchb/key-staff.html
- Department of Education Office of Special Education Programs (OSEP)

https://www2.ed.gov/about/offices/list/osers/osep/index.html

CDC Resources

https://www.cdc.gov/ncbddd/hearingloss/freematerials.html

- **Decision Guide to Communication Choices**
- **Making a Plan for Your Child**
- **Questions You May Want to Ask Your Child's Audiologist**
- **Questions You May Want to Ask Your Child's Early Interventionists**
- **Questions You May Want to Ask Your Child's Physician**

Government Grant-Funded National Technical Assistance Centers

- EHDI-National Center for Hearing Assessment & Management (NCHAM)
- Family Leadership in Language and Learning (FL3)-Hands & Voices
- Early Childhood Technical Assistance Center (ECTAC)-Frank Porter Graham Center

Listening and Spoken Language Resources

- www.hearingfirst.org
- www.agbell.org
- www.agbellacademy.org

What We Know

a.g.bell
Association for the Deaf & Hard of Hearing

LISTEN–LEARN–LINK:
NEW PARENT HOTLINE

Hotline Contact Info
(Remember, you are not alone)

Hotline Available Monday-Friday

newparenthotline@agbell.org

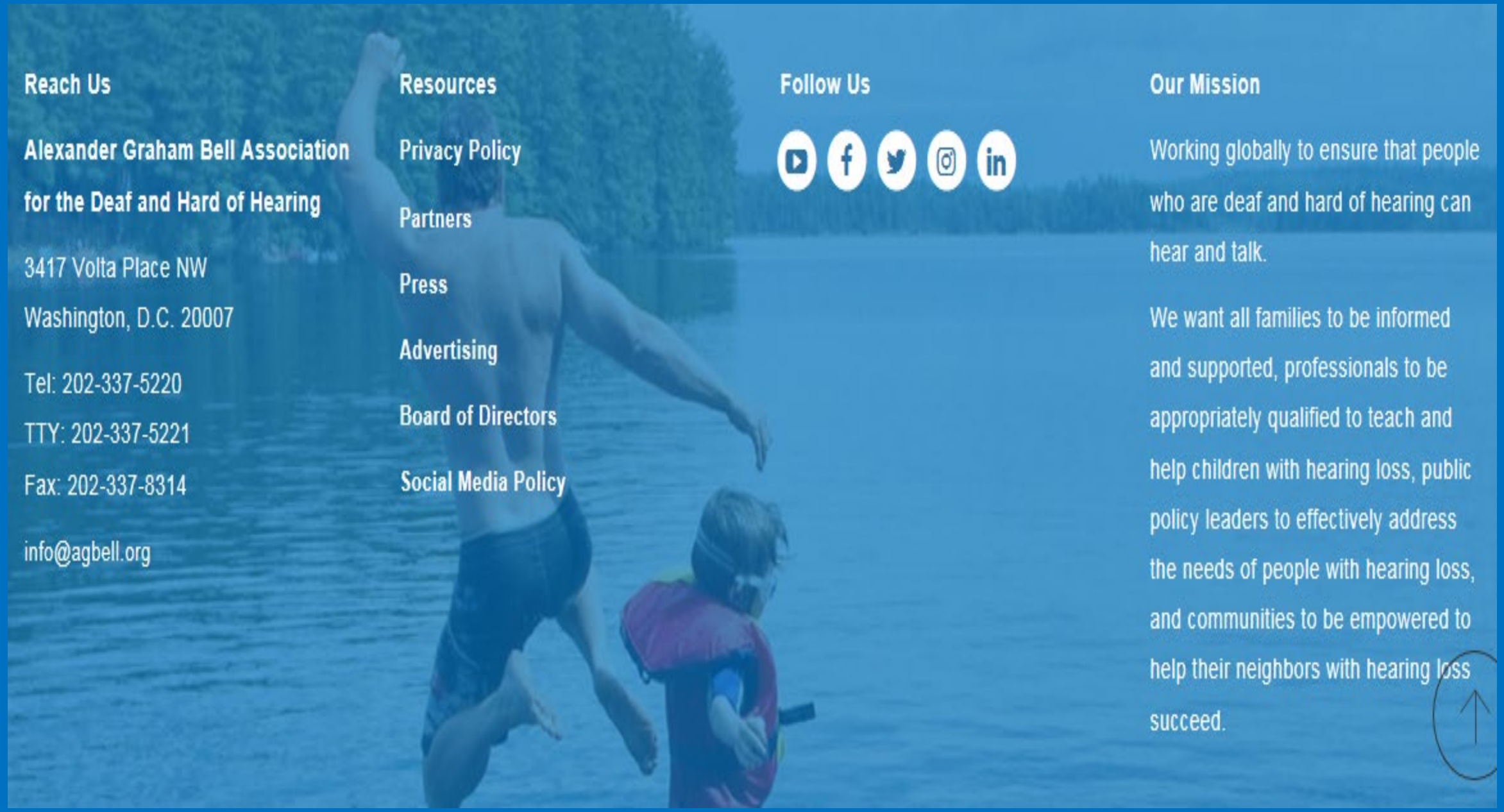
In the U.S.
1-833-LSL-LINK
(1-833-575-5465)

International - Zoom video conference calls can be scheduled by request.

Sponsored by:

Cochlear®

ReSound GN



Reach Us

Alexander Graham Bell Association for the Deaf and Hard of Hearing

3417 Volta Place NW

Washington, D.C. 20007

Tel: 202-337-5220

TTY: 202-337-5221

Fax: 202-337-8314

info@agbell.org

Resources

- Privacy Policy
- Partners
- Press
- Advertising
- Board of Directors
- Social Media Policy

Follow Us

Our Mission

Working globally to ensure that people who are deaf and hard of hearing can hear and talk.

We want all families to be informed and supported, professionals to be appropriately qualified to teach and help children with hearing loss, public policy leaders to effectively address the needs of people with hearing loss, and communities to be empowered to help their neighbors with hearing loss succeed.

EHDI Involvement Chart

Guignard, 2018

EHDI Component	Action/Question/ Feedback/Praise (WHAT)	Reason for Doing (WHY)	Person to Contact (WHOM)	Strategy to Use (HOW)	By this Date (WHEN)
NBHS					
Early Childhood Hearing Screening					
Diagnostic Audiology					
Early Intervention					
Family Support and Partnership					
Medical Home					
Data Management					
Financing & Reimbursement					
Program Evaluation					

Ask Anything