

## Serving Children with Hearing Loss & Multiple Disabilities/ Challenges

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## Outline

- Definitions & Statistics
- Implications for Audiological Management
- Cochlear Implantation & Children with Multiple Disabilities
- Factors that Influence Learning in Special Populations
- Setting Goals
- Creating a Learning Environment to Facilitate Receptive Communication & Language Development
- Summary & Future Directions

## Multiple Disabilities Defined

- The combination of two or more disabling conditions
  - These conditions may include deafness in association with blindness, cognitive impairment/delay, autism, and/or physical impairment

**“It is the reduction in possibilities for compensation, whether spontaneously or after intervention, that makes a child multiply disabled”**

(Knors and Vervleod, 2003)

## Statistics: Children with Hearing Loss/Disabilities

- ~40% of deaf and hard-of-hearing (deaf/HOH) children have co-occurring conditions.
- Several studies have found that 50-75% of deaf/HOH children with multiple disabilities have more than one additional disability.
- Among children who meet audiologic criteria for cochlear implantation, proportionally fewer children with additional disabilities receive implants than children who present with hearing loss alone (Fortnum et al., 2002; Fortnum et al., 2006; Holden-Pitt, 1997)
- Children with CIs are less likely to have two or more disabilities compared to children without CIs

## Causes of HL in Children

- Genetic (50%)
  - 70% autosomal recessive
  - 15% autosomal dominant
  - 15% all other types of inheritance
- Non-Genetic (25%)
- Unknown (25%)

### Congenital Anomalies and In Utero Infections

- Charge Syndrome
- In Utero Infections:
  - CMV
  - Herpes
  - Rubella/German Measles
  - Syphillis
  - Toxoplasmosis

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### Postnatal/Acquired Conditions

- Low birth weight / Hypoxia
- Ototoxicity
- Hyperbilirubinemia
- Meningitis

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### Disabilities That Occur with Deafness (%)

Deafness with No Other Disabilities	60.1
Learning Disability	10.7
Intellectual Disability	9.8
Attention Deficit Disorder (ADD/ADHD)	6.6
Blindness and Low Vision	3.9
Cerebral Palsy	3.4
Emotional Disturbance	1.7
Other conditions	12.1

Gallaudet Research Institute, Jan 2003

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### Intellectual Disability (10%)

- Largest Group: **Down Syndrome**
- Most children with intellectual disabilities have HL in one or both ears
  - Some estimates approach 80%
- Intellectual disabilities affect language, learning, socialization
- Intellectual disabilities are exacerbated by hearing loss

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### Learning Disabilities (11%)

- 4 types of learning disorders:
  - reading, written expression, mathematics, and learning disorder “not otherwise specified”
- Domain-based
  - Focus on cognitive abilities,
    - phonological awareness, listening comprehension, word retrieval

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### Attention Disorders (7%)

- ADD/ADHD (5% in general population)
  - Inattention
  - Distractibility
  - Impulsivity
  - Hyperactivity
- Can interfere with all aspects of development
  - Educational achievement
  - socialization
- Parents and teachers may over-identify
- Need for Comprehensive Medical Evaluation
  - Medication for AD


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## Visual Impairment (4%)

- Genetic Syndromes
  - Usher
  - Goldenhar
- Congenital / Perinatal
  - CHARGE, CMV, meningitis

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## Congenital Cytomegalovirus (CMV)



- CMV infection is the most common intrauterine viral infection
- Sensorineural hearing loss (SNHL) is the most common sequela affecting 22 to 65% of affected children (Dahle, et al., 2000; Fowler & Boppana, 2006)
- CMV can result in several other developmental disabilities, including blindness, cognitive impairments, and motor impairments
- Results of research performed with CI children with CMV:
  - Scores on measures of speech intelligibility and closed-set sentences were lower than non-CMV children (Rameriz Incoe and Nikolopoulos, 2004)
  - There was a wide range of performance for both CMV and non-CMV children (Rameriz Incoe and Nikolopoulos, 2004)
  - Outcomes in Speech Perception Categories for CMV children were highly variable, with some children making minimal progress and others making substantial gains (Lee et al., 2005)

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## CHARGE Syndrome



- CHARGE Syndrome is an autosomal dominant disorder from mutations in the chromodomain helicase DNA-binding protein-7 gene (Vissers et al., 2004)
- The diagnosis of CHARGE is based on a combination of the following features:
  - Facial clefting
  - Dysmorphic facies
  - Tracheoesophageal fistula
  - Short stature
  - Developmental delay
- Hearing loss and cognitive and developmental sequelae are common features of CHARGE
- Studies have shown the CI outcomes in children with CHARGE are often:
  - Improvement on either closed-set or modified open-set word and sentence recognition
  - Identification of syllable patterns and Ling sounds
  - None of the children were reported to have developed spoken language (Jorgensen et al., 1995; Bauer et al., 2002; Au et al., 2004)

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## Deaf-Blindness

- Child cannot be accommodated in special education programs designed for children with deafness or blindness.
- Approx 11,000 deaf-blind children in U.S.
- Most have severe developmental disabilities

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## Cerebral Palsy (3.4%)

- Three Main Forms
  - Spastic CP stiff, difficult movement
  - Athetoid CP involuntary and uncontrolled movements
  - Ataxic CP disturbed sense of balance, position in space, and overall lack of coordination
- Classification made according to the age of diagnosis
  - 70% of CP occurs prior to birth (prenatal)
  - 20% occurs during the birthing period (perinatal)
  - 10% occurs during the first two years of life (postnatal)
- Remarkably little research on HL in CP

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## Implications for Audiological Management

## Audiologic Assessment

- Many of same components
  - Test battery
  - Coordination of multiple disciplines
- Delays can be prevented by competent, proactive management



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## Goal of Audiologic Assessment

- To obtain the info needed to proceed with hearing aid selection and fitting
  - Approximation of HL degree and configuration
  - Need accurate estimate of low and high frequencies
- Children with multiple disabilities tend to be later diagnosed and fitted
- Need to identify centers with the experience and institutional support to manage these children well

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## Considerations in HA Selection

- Flexibility in hearing aid circuitry
- Volume control covers
- FM may be useful for young children on ventilators
- Remote controls for children with poor head control
- Multiple care providers necessitate easy operation/maintenance of devices

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## Close Follow-up is Essential

- 1 month
- Every 3-4 months
- On-going diagnostic assessment
- On-going electroacoustic analysis
- On-going monitoring for OME
  - Health implications
  - Hearing aid implications

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## Assessment of Aided Performance

- Formal and Informal
- Referral for Cochlear Implant
  - At one time, children with MD not considered CI candidates
  - Many centers will – if no medical contraindications and reasonable chance of benefit
  - Success may need to be defined differently


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## Cochlear Implantation & Children With Multiple Disabilities

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## Introduction

- Over the past ten years, the number of deaf children with additional disabilities receiving cochlear implants (CI) has increased from 8% to 25-50% (Pyman et al., 2000; Wiley et al., 2004).



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## 4 Factors Contributing to Increase of CI Children with additional Disabilities

- Early pediatric trials of CI excluded deaf children with additional disabilities
- Physiological based techniques have been developed to estimate important programming parameters in children not fully able to participate in mapping.
- Implementation of newborn hearing screening programs world wide
- The FDA's lowering of the recommended age for implanting children from 2 years to 1 year

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## Evidence with this Population is Lacking

- Due to...
  - The low number of deaf children with additional disabilities resulting in limited research (Edwards, 2007; Holt & Kirk, 2005)
  - The wide variety in type and extent of disability; combining many types of disability into one report makes it difficult to apply outcomes to specific groups
  - No consistent criteria as to what constitutes "benefit" and how it should be quantified

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## Communication Mode

- A greater proportion of children with multiple disabilities were reported to use some form of sign-supported communication following cochlear implantation than children without additional disabilities
- 100% of typically developing children were able to use oral communication in comparison to 59% of children with additional disabilities (Waltzman et al., 1997).
- In a study performed by Wiley et al. (2004), 66% of 32 children with only one additional disability implanted used Total Communication (TC), compared to 47% of 37 children with no other disabilities.

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## Other Perceived Benefits of Implantation

- Donaldson et al. (2004) survey families in their study of children with Autism Spectrum Disorder (ASD) who received implants

**Results:**

- Families noticed changes in responsiveness to sound including increases in vocalization, eye contact, and interest in music
- Increased response to requests
- Improved sound awareness and speech perception
- Tendency to use speech in communication during play resulting in improvement in the child's peer interactions

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## Clinical Considerations for Candidacy

- A large number of variables come into play when considering candidacy; however, spoken language is the goal in sight and the decision to implant is based largely on a child's potential for developing oral language skills
- Access to sound is not synonymous with access to language. Language requires the development of higher level information processing skills including:
  - Working memory
  - Speed of verbal rehearsal
  - Patterns of lexical access
- (Dawson et al., 2002; Pisoni & Cleary, 2003; Pisoni et al., 2000)

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## Clinical Considerations for Candidacy

- Electrical Stimulation is not equivalent to acoustic stimulation
  - On average, children with detection thresholds in the “mild loss” range function more like children with moderately-severe to severe hearing losses using amplification in terms of speech perception, speech production, and language.
  - (Blamy et al., 2001; Boothroyd & Boothroyd-Turner, 2002; Eisenberg et al., 2004)
- Conditions such as cognitive impairment, autism, and specific learning disabilities can compromise a child’s ability to receive or process information through the visual channel (Jones & Jones, 2003; Knoors & Vervloed, 2003)
- Thus, for some CI children with additional disabilities, multimodal communication approaches are more effective than approaches that emphasize one sensory channel over another

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## Clinical Considerations for Candidacy

- It may be difficult to ascertain the what extent the communication delay or impairment can be ascribed to the hearing loss vs. other conditions
- Thus, decisions about implantation of any given child with hearing loss and multiple disabilities should be based on developmental expectations for a hearing child with comparable ability/ disability.

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## Objectives for Implantation

The *minimum* objectives for cochlear implantation in children with multiple disabilities could be:

1. **Improved auditory awareness**, including the ability to detect the voices of family members and other significant individuals.
2. **Improved communication**, supported by access to sound, in the modality or combination of modalities most appropriate for the child.
3. **Improved ability to participate in the world around them** through perception of environmental sound relevant for their development and safety.



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## Realistic Expectations

- Families’ goals for their child should be explored in pursuing implantation
- However, it is important for families to have realistic expectations to understand that CI does not result in “normal” hearing
- Due to large variability in outcomes (including typically developing children), it is not always clear what “realistic” may mean (Zaidman-Zait & Most, 2005)



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## Realistic Expectations

- Several studies and significant data have been used to illustrate important points:
  - Variability in skill acquisition is large, even among children without additional disabilities
  - Skills are acquired over years, even among otherwise typically developing children
  - Children with additional developmental disabilities can and do demonstrate improved sound detection fairly soon following implantation

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## Realistic Expectations

- Some children with additional developmental disabilities are able to participate in formal speech perception testing, demonstrating skills commensurate with those shown by some children without known additional disabilities at the same assessment interval
- For most children with additional developmental disabilities, progression through this hierarchy of auditory skills lags behind their more typically developing peers.



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### Educational Setting and Support for Auditory Skill Growth

- For deaf children with multiple disabilities with or without CIs, studies examining educational variables associated with better outcomes is largely lacking (Jones & Jones, 2003; Knoors & Vervloed, 2003).
- Educational settings supportive of auditory skill growth will be associated with greater gains than those that emphasize visual communication with little or no voicing.
- Auditory goals and opportunities for learning to listen should be balanced among the broader developmental goals established for the child

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### Contraindications for Cochlear Implantation in Children with Multiple Disabilities

- Some conditions that contraindicate CI may include
  - Severe intellectual disability (Hamzavi et al., 2000)
  - Severe behavioral disturbances with autoaggression (Hamzavi et al., 2000)
  - Psychosis (Filipo et al., 2004)
  - Therapy resistant seizure disorder
  - Neural and/or central deficits
  - Hyperactivity (Bertram, 2004; Bertram et al., 2000)
  - Autism (depending on severity)
- Appropriate expectations should be in place and each child should be considered on a case-by-case basis.

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### Educational Follow-up and Monitoring

- Continuing communication with educational providers is critical to ensuring that the teachers, therapists, and classroom aids are comfortable with the equipment and that the child is using the CI consistently.
- If needed, the team based educational specialist can provide training in managing the equipment and/or the use of classroom amplifications systems.
- A new IFSP or IEP may need to be written that incorporates new educational goals and services related to the child's use of the new device.

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### Developmental Assessments and Monitoring

- CI children with multiple disabilities may benefit from ongoing follow-up by a developmental pediatrician
- Such contact would support overall monitoring of a child's developmental needs across all domains
- Periodic reassessment of the child's skill levels can also help identify the next set of developmental goals to consider in educational planning.



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### General Consideration in Assessing & Monitoring CI Children with Multiple Disabilities

- In the evaluation of some children with hearing loss & multiple disabilities, **standardized assessment batteries may not even be appropriate.**
- **Teachers, therapists, and parents can provide insight** into strategies that have worked or not worked for a specific child in the past
- **Combining formal and informal** approaches to assessment is important
- A new tool called The Champions-Evaluation Profiles for Paediatric Cochlear Implant Users with Additional Disabilities provides a means for documenting functional change and benefit following cochlear implantation (Herrmannova, 2008)

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### Factors that Influence Learning in Special Populations

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### The Critical Factors of Receptive & Expressive Communication- Considerations of Communication Before Language

- Form(s) = A way to communicate
- Intents/Functions = A reason to communicate
- Content = Something to communicate about
- Context = The social and physical environment in which communication takes place

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### Influencing Factors for Individualized Instruction

- These are just *some* of the possible factors that could influence progress:
  - Age of onset of hearing loss (as well as onset of other disabilities)
  - Severity of the disabilities/loss (vision, hearing, physical, motor, medical)
  - Impact of concomitant disabilities
  - Age of diagnosis and intervention
  - Use of vision and auditory devices & AT
  - Cognitive and social development
  - Support and training of the family
  - Skills of the early interventionist and/or educator; skills of the "team" who are serving the child/family
  - Consistency & "depth" of services that the child/family has received
  - For older children, the "comprehensiveness" of the educational program; the program should have a range of services with well-trained educators & related service providers

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### How Are Children With Multiple Disabilities Different From a Typical Child with Hearing Loss?

- Co-occurring factors may create global challenges to learning/intervention:
  - Lack of intentional behavior (causality)
  - Lack of joint attention during play/interactions
  - Low rates of social interaction/lack of initiation
  - Limited actions on objects and toys (mouthing/throwing)
  - Low rates of turn-taking
  - Absence of prelinguistic communication
  - Lack of clear behavioral responses to pure tone signals
  - Lack of consistent wearing of hearing aids

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### Cognitive & Social Development: Impact on Communication & Language Development

*"Language cannot get off the ground until some minimal set of cognitive infrastructures are finally in place, including cognitive structures that are necessary though (perhaps) not sufficient for the establishment of reference and predication."*

Bates et al., 1995

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### Building Blocks for Success

- Expectations – high **but appropriate** expectations
- Programming – early intervention and educational services/placements
  - Not Just the IFSP/IEP goals
  - Skills of the providers
- Equipment Management

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### Establishing Expectations

- Uncertainty
  - Short & long term goals should be discussed early and often
  - Consensus across team (...yes, often there is a team with these children!)
  - May need to use a different "measuring stick"
- Rate of Progress – may be slower in some areas of development; may be not in others
- Augmentative Communication – what other assistive technology may be beneficial for the child? – (For example, the new I-Pad has extensive augmentative "apps" to download)

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**Considerations for Planning Intervention for Children Who Are Deaf / Multiple Disabilities**


- The tremendous differences between the children – the need for individualization.
- The need for multiple disciplines planning and intervening – collaborative teaming.
- The need to teach caregivers specialized procedures for teaching the “What” and the “How” of intervention.



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**Child – Specific Issues/Factors**

- Cognitive deficit
- Language learning problem
- Attention – can’t stay on task
- Oral-motor / Gross Motor
- Poor short-term memory
- Syndromes & Genetics
- Vision & Hearing (Progressive component? Ushers?)
- Social – poor socialization; difficulty integrating with other children; impact on social language development
- Medical – additional medical conditions
- Hyper/hyposensitivity / Sensory Integration



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**Important Social Factors**



- Reacting to the emotions of others
- Engaging in the social interaction
- Joint attention/activity
- Turn-taking
- Awareness other’s communicative intent
- Understanding the “theory of the mind”
- Imitation

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**Important Cognitive Factors**

- Anticipation (Based on “cues” and repetition)
- Causality (Social and Physical)
- Means-End/Tool Use
- Object Use, Object Permanence, Spatial Relations
- Coordinating Objects and Persons
- Imitation
- Symbolism (Pretend Play & Representational Gestures)
- Understanding that specific symbolic gestures and words “stand-for” individual objects, locations, actions, and features.

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**Setting Goals**

**Examples of Goals-(no joke!)**

- Child will increase his expressive and receptive vocabulary
- Child will use sign language or spoken language to name all colors and common objects
- Child will use his cochlear implant at school
- Child will say or sign his own name
- Child will become more sociable with children
- Child will increase reading
- Child will use his FM system in his classroom
- Child will use his cochlear implant to recite weekly vocabulary
- Child will increase the level of complexity of his language in relation to his same-age peers within his classroom on at least three tasks as judged by the teacher for 80% of the time.

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### What is Wrong?

- Need long-term goals = broad
- Need short-term goals = very specific for each therapy session
- Need specific time-frame
- Need to base goals on normal developmental milestones
- Need to base goals on parent stated preferred method of communication depending on hearing age and language functioning/language age

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### Goals – Make them S.M.A.R.T

- The concept of SMART goals borrowed from business, personnel development, and non-profit experience:
  - Specific: who, what, where, when, why
  - Measurable: How much growth? Quantify!
  - Attainable: Developmentally appropriate; most important
  - Realistic: Is it possible? Is the child able to do it?
  - Timely: Exactly when will the child master the goal?

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### The Starting Line

- Diagnostic-Cottage Acquisition Scales for listening, language, and speech (CASLLS)
- Each therapy session is diagnostic
- Use “hearing age” to compare with chronologic age
  - Long-term goal is to close the gap between the two
- Normal development of speech:
  - Vowels
  - Phoneme development- (/b/, /m/, /w/, /p/, /n/, /h/)

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### AUDITORY GOALS Hearing age 0-12 months

- Child will respond to the sounds of the six sound test (/a/, /i/, /u/, /s/, /m/) using a conditioned response and 80% of the time in therapy sessions
- Clinician/parent will use the hand cue to encourage imitation on demand those phonemes produced spontaneously, presented through audition alone 80% of the time
- Child will imitate vowel and diphthong variety 80% of the time when sounds are presented through audition
- Child will imitate motions and suprasegmental qualities (pitch, duration, intensity) of nursery rhymes/songs presented to her through listening alone 80% of the time

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### AUDITORY GOALS Hearing age: 0-12 months

- Child will identify familiar stereotypic phrases presented through audition alone by responding appropriately (e.g “Wheres momma?” “Wave bye-bye.” ) 80% of the time
- Child will imitate approximations of “learning to listen” sounds varying in suprasegmental and vowel content 80% of the time. (Sounds are presented through audition alone)
- Child will respond to environmental sounds at loud, medium, and soft intensity levels 80% of the time at close range (3 feet), medium range (6 feet), and a distance of 12 feet by pointing to her ear or searching for the sound source.
- Child’s family will continue to demonstrate an understanding of auditory goals and incorporate them into her everyday routines and play with 90% accuracy and consistency.

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### LANGUAGE GOALS Hearing age: 0-12 months

- Child will respond to input of “power words” presented through audition alone 90% of the time in therapy and in home situations.
- Child will produce 2-3 words by 12 months of listening age
- Input of new vocabulary will be provided for home carry-over in each session - with 5 new words per week.

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**COGNITION GOALS**  
**Hearing age: 0-12 months**

- Child will attend and participate in therapy activities and a listening "attitude" will be gained by 6 months post-activation, with child attending during structured activities for at least 30 minutes
- Child will attend to 5-10 books per day when presented by parent at home

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**Creating a Learning Environment to Facilitate Receptive Communication & Language Development**

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**Levels of Receptive Language (Geers & Moog, 1990: Examples**

- Awareness that the mouth/voice conveys information
- Comprehension of a few words or expressions
- Ability to learn new words
- Ability to acquire new receptive vocabulary in phrases and sentences
- Comprehension of successive phrases and sentences

\* For children with multiple disabilities, other receptive "Communication" skills may be targeted as well.

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**Young children first begin to anticipate events and activities based on non-language forms:**

- Young children begin to understand the meaning of others through facial gestures, intonation(s), pitch, movement, and touch when these behaviors are part of a familiar routine.
  - Suprasegmentals are important to reinforce language learning!
- Early in development, children also learn to associate certain objects, sounds, and smells with routine, care giving activities.
  - Routines are important!
- What we teach needs to be meaningful.
  - Functional use of language in functional situations – is important!

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**Points: We need to determine what aspects of a communication exchange the child comprehends**

- A child with multiple disabilities may have different receptive and expressive systems.
- We need to assess how children anticipate and begin to understand meaning.
- Comprehension precedes production fairly dramatically with typical children.
- We need to use this information in designing communication & language production for children with disabilities.

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**Determining what receptive forms will support auditory perception of words**

- The child's vision and cognition play an important role in determining supportive cues,
- Initially, these cues (contextual, visual, tactile, & auditory) will be used for communication,
- Later, they can be used to support the learning of "receptive verbal words."


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### Speech

- As more and more children receive cochlear implants, we need to focus on the sequence of auditory perception and speech comprehension.
- Early behaviors may include responding to motivational environmental cues and toys sounds.
- Verbalizations of different pitch, tones, duration, patterns within social games; using the child's name, simple directions in social interactions.

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### Auditory Perception



Auditory perceptual activities can be implemented while the child is working on receptive communication

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### Ten Auditory Processes

#### 1 Learning to Listen

Auditory Attention	Learning to pay attention to sound
Auditory Memory	Learning to remember sound heard
Auditory Discrimination	Learning to tell the difference between sounds
Auditory Integration	Learning to associate sounds and words with what you see, feel, experience

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Linda Daniel 1998

### Ten Auditory Processes

#### 2 Learning to Talk

Auditory Feedback	Learning to imitate speech sounds of the language through hearing
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Linda Daniel 1998

### Ten Auditory Processes

Linda Daniel 1998

#### 3 Learning Language

Auditory Recognition	Learning to recognize words and environmental sounds
Auditory Sequencing	Learning to reproduce sounds and words in the right order
Auditory Comprehension	Learning to understand spoken conversation
Auditory Retrieval	Learning to use spoken language spontaneously
Auditory Application	Learning to use hearing and speaking for reading, writing, and academic content areas

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### Detection – Use of Listening Cue

<p><b>Non-Speech Sounds</b></p> <ul style="list-style-type: none"> <li>• Environmental sounds</li> <li>• Toy sounds</li> <li>• Animal sounds</li> </ul>	<p><b>Speech Sounds</b></p> <ul style="list-style-type: none"> <li>• Accentuated pitch contours</li> <li>• Slower cadence</li> <li>• Repetition (paced)</li> <li>• Elongated vowels</li> <li>• Key words exaggerated</li> <li>• Simplified semantics</li> </ul>
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( Nancy Mellon (2000) in J.K. Niparko (Ed) ) ( 72 )

## Discrimination

- Discrimination between environmental sounds (door bell, door, microwave)
- Discrimination between voices
- Discrimination between inflections that express different functions (no, teasing, directive, descriptive talking)
- Note: Other children with hearing loss WITHOUT other disabilities or cognitive deficits may spend very little time working on discrimination tasks.

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## Model for Listening

- Discrimination
- Same /different tasks primarily used for clarification of identification and comprehension errors
- Specific discrimination activities are generally used for remediation.

## Model for Listening

- Identification
  - the ability to label by repeating, pointing to, or writing the speech stimulus heard
- Suprasegmentals
  - Prosodic features of speech (duration, rate, pitch, intensity, stress, intonation)
    - Duration: awareness of duration changes, long vs. short sounds, various combinations, and self-monitoring of duration changes

## Model for Listening

- Prosodic Features cont' d
  - Rate: awareness of rate changes, fast and slow sounds, phrases spoken at fast, slow, or medium rates., self-monitoring
  - Pitch: awareness of pitch changes, high, low and moderate pitch, rising and falling pitch, self-monitoring
  - Intensity: awareness of intensity changes, high, moderate, and low intensity, self-monitoring
  - Stress: awareness of stress changes, stress changes, self-monitoring
  - Recognition of male, female, and child voices (male-125Hz, female-250Hz, child-325Hz)

## Model for Listening

- Angry, sad, and happy voices
  - emotional content of voice
- Respond to own name and names of other people
- More *Learning to Listen Sounds* and word approximations
- Segmentals
  - Phonemes by manner: b vs. m vs. h
  - Imitate a variety of phonemes (b, m, d, t, h, sh, s, f, th, etc.)
  - Word varying in number of syllables

## Model for Listening

- One-syllable words varying in vowel and consonant content (e.g. house, tree, dog, cat)
- Develop memory and expressive production for one word
- Stereotypic messages (familiar expressions and directions) e.g. brush your hair, tie your shoe
- Words in which the consonants are identical and the vowels differ (e.g. ball, boat, bat, bite)

### Model for Listening

- Words in which the vowel are identical and the consonants differ in manner and place of articulation, and in voicing
- Words in which the vowels are identical and the consonants differ only in manner of articulation (e.g. bat, mat, fat)
- Words in which the vowels are identical and the consonants differ only in voicing (e.g. fan, van; bat, pat)

### Model for Listening

- Comprehension
  - Auditory Memory & Sequencing
    - Familiar expression
    - Follow single directions
    - Follow two directions
    - Sequence two - three - four critical elements
    - Sequence three directions
    - Sequence multi-element directions
    - Follow classroom directions

### Model for Listening

- Comprehension, Continued
  - Auditory/Cognitive Skills in a Structured Listening Set
    - Sequence series of multi-element directions
    - Make identification based on several related descriptors
    - Sequence three - four - five events
    - Recall five details of an event, story, or lesson
    - Understand the main idea of a lesson or complex story

### Model for Listening

- Comprehension, Continued
  - Auditory/Cognitive Skills in Conversation
    - Answer questions requiring comprehension of the main idea of a short conversation
    - Paraphrase remarks of others
    - Offer spontaneous relevant remarks
  - Figure Ground
    - Quiet environment, regular noise, noisy environment

### Model for Listening

- Comprehension, Continued
  - Figure Ground
    - At varying distances
      - next to sound source, five to six feet from the sound source, across the room from sound source
    - Add the presence of distractions
      - fan-type noise, cafeteria noise, four-speaker babble, one speaker babble/ conversation

### Children begin to interpret the “intent” of their caregiver as:

- You want to play with me (joint activity)
- You want me to turn to my name (calling)
- You want me to stop doing what I am doing (protest/rejection)
- You want me to respond to you
- You want me to give you this object
- You want me to look at something (joint attention)

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## Intentional Communication Acts

- Intentional communication acts include:
  - an orientation to the other person,
  - a clear message,
  - a clear intent, and
  - continued acts to get message across



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## Levels of Expressive Language Skills (Geers & Moog, 1990)

- Awareness that vocalizations are used to communicate
- Ability to use a few syllables, words or expressions
- Ability to learn new expressive vocabulary
- Ability to acquire new vocabulary fairly readily
- Ability to join 2-3 words together
- Ability to combine verbs and nouns in phrases and sentences
- Ability to use sentences with more than 1 type of modifying word...
- \* What children with multiple disabilities may need to learn before these skills...

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## Understanding How Children with Disabilities May Initially Communicate

- Children with disabilities often communicate in unique ways
- Children may send messages using one form and receive messages using another form.
- Children are most likely to learn to communicate their wants and needs
- Children are most likely to communicate in their own natural environments
- Children first communicate in the "here and now"
- Children need routines within their natural environments to learn to communicate

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## Understanding How Children with Disabilities May Initially Communicate

- Children's receptive communication usually precedes the development of their expressive communication.
- Caregivers begin to "interpret" the meaning of their student's smiles, vocalizations, facial gestures before children have any "intent" of impacting the caregiver.
- Children demonstrate "intentional motor behaviors" prior to the development of "intentional communication."
- Early "intentional" (eye gaze, gesture, etc.) communication occurs in many forms prior to the development of speech and language.

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## Summary/Conclusions

- ~ 40% of children with HL have one or more disabilities; some include severe illness
- Diagnosis & intervention can occur on a timely basis but it takes competent and proactive audiologic management - and advocacy when needed
- Children should not be "defined" by their disabilities
- Well coordinated teamwork is critical
- Communication and support for families is paramount
- Every child deserves an opportunity to hear
- Special children have unique needs.
- 1,000,000:1 chance need not be the odds of achieving rewarding use of hearing in challenging cases.

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## Future Directions

- There is reason to be optimistic about future trends in cochlear implantation in deaf children with multiple disabilities
- As CI centers gain increasing experience in implanting children from special populations, they will be more likely to implant those children with special needs at younger ages as well.
- Improvements in hearing aid technology are likely to provide access to a higher quality of auditory input for all infants in the preimplant period
- Thus, many children with hearing loss & additional disabilities will not only present for CI consideration at earlier ages, but may also have had more auditory experience on which to build in the post implant period

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## Resources/References

- Jack Roush, PhD, Professor & Director  
Division of Speech & Hearing Sciences  
University of North Carolina – Chapel Hill
- Kat Stremel Thomas  
The Teaching Research Institute  
Western Oregon University

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## References/Resources

- Alexander Graham Bell Association for the Deaf & Hard of Hearing – [www.agbell.org](http://www.agbell.org)
  - AG Bell Academy for Listening & Spoken Language ([www.agbellacademy.org](http://www.agbellacademy.org))
- Beginnings of North Carolina ([www.beginningssvcs.com](http://www.beginningssvcs.com))
- NCHAM ([www.infanthearing.org](http://www.infanthearing.org))
- Dr. Donald Goldberg – Cleveland Clinic/College of Wooster
- Kathryn Wilson, MA, CCC-SLP, Cert. AVT
- Dr. Karl White – Utah State University/NCHAM
- Dr. Mary V. Compton – University of North Carolina-Greensboro
- Heather Rose, MA, CCC-SLP, LSLS Cert. AVT
- Dr. Ann Geers & Jean Moog, MA
- Linda Daniel, MS, LSLS Cert. AVT

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## Resources

- American Academy of Audiology (AAA) ([www.audiology.org](http://www.audiology.org))
- American Academy of Otolaryngology-Head & Neck Surgery ([www.entnet.org](http://www.entnet.org))
- American Speech-Language-Hearing Assn. (ASHA) ([www.asha.org](http://www.asha.org))
- Advanced Bionics Corporation ([www.bionics.com](http://www.bionics.com))
- Boystown National Research Hospital ([www.babyhearing.org](http://www.babyhearing.org))
- Cochlear Americas ([www.cochlearamericas.com](http://www.cochlearamericas.com))
- Deafness Research Foundation ([www.drf.org](http://www.drf.org))
- First Years ([www.firstyears.org](http://www.firstyears.org))

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## Resources

- ▶ John Tracy Clinic ([www.johntracyclinic.org](http://www.johntracyclinic.org))
- ▶ Listen-Up ([www.listen-up.org](http://www.listen-up.org))
- ▶ MED-EL Corporation ([www.medel.org](http://www.medel.org))
- ▶ National Institute on Deafness and Other Communication Disorders (NIDCD) ([www.nidcd.nih.gov](http://www.nidcd.nih.gov))
- ▶ Oral Deaf Education ([www.oraldeafed.org](http://www.oraldeafed.org))

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## Resources

- FM Systems
  - Audio Enhancement ([www.audioenhancement.com](http://www.audioenhancement.com))
  - Phonic Ear Inc. ([www.phonicear.com](http://www.phonicear.com))
  - Phonak Inc., USA ([www.phonak-us.com](http://www.phonak-us.com))
  - Lightspeed Technologies ([www.lightspeed-tek.com](http://www.lightspeed-tek.com))

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## WEBSITES/Resources

- Alexander Graham Bell Association for the Deaf and Hard of Hearing ([www.agbell.org](http://www.agbell.org))
- National Cued Speech Association ([www.cuedspeech.org](http://www.cuedspeech.org))
- Oral Deaf Education ([www.oraldeafed.org](http://www.oraldeafed.org))
- LeClerc/Gallaudet University (<http://clerccenter2.gallaudet.edu>)
- American Society for Deaf Children ([www.deafchildren.org](http://www.deafchildren.org))
- Hands & Voices ([www.handsandvoices.org](http://www.handsandvoices.org))
- National Center for Hearing Assessment & Management ([www.infanthearing.org](http://www.infanthearing.org))
- Deafness Research Foundation ([www.drf.org](http://www.drf.org))
- Beginnings for Parents of Children Who are Deaf or Hard of Hearing ([www.ncbegin.org](http://www.ncbegin.org))
- National Institute on Deafness and Other Communication Disorders ([www.nidcd.nih.gov](http://www.nidcd.nih.gov))
- National Dissemination Center for Children with Disabilities ([www.nichcy.org](http://www.nichcy.org))
- Raising Deaf Kids ([www.raisingdeafkids.org](http://www.raisingdeafkids.org))
- My Baby's Hearing ([www.babyhearing.org](http://www.babyhearing.org))
- CENTE-R (<http://center.uncg.edu>)

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**Guidelines & Position Statements**

- *Joint Committee on Infant Hearing Year 2007 Position Statement*
- *State EHDI Guidelines*
- *American Speech-Language-Hearing Association (2004). Guidelines for the audiologic assessment of children birth to 5 years of age*
- *American Academy of Audiology Pediatric Amplification Protocol (2003)*

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**Guidelines & Position Statements**

- *American Speech-Language-Hearing Association (1992). Sedation and topical anesthetics in audiology and speech-language pathology. Asha, 34 (March Suppl. 7), 41-42.*
- *American College of Medical Genetics (2002): Genetics evaluation guidelines for the etiologic diagnosis of congenital hearing loss. Genetics in medicine, 4 (3), 162-171.*
- *Academy for Listening & Spoken Language, Alexander Graham Bell Association for the Deaf & Hard of Hearing*

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**Guidelines & Position Statements**

- *Alexander Graham Bell Early Intervention Best Practice Model*
- *The National Agenda: Moving Forward on Achieving Educational Equality for Deaf and Hard of Hearing Students (April 2005) Goal One: Early Identification and Intervention*
- *Report and Recommendations of the 2004 National Consensus Conference on Effective Educational and Health Care Intervention for Infants and Young Children with Hearing Loss*

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***Thank You for Listening!***

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