OUTLINE

- Why should you care about hearing in children?
- What do you need to know about devices and treatment for children with hearing loss?
- How does hearing loss impact the children we work with?
- What is your role in minimizing the impact of hearing loss on children?
WHY SHOULD YOU CARE ABOUT HEARING IN CHILDREN?

- HOW DO WE HEAR?
- AUDITORY DEVELOPMENT
- AUDITORY INPUT IMPACTS LANGUAGE AND BRAIN DEVELOPMENT
- HEARING LOSS IMPACTS MANY CHILDREN
HOW DO WE HEAR?
INFANTS ARE BORN WITH AN AUDITORY SYSTEM THAT IS BOTH MATURE AND IMMATURE

**Age of Maturation**

- 20’s
- Adolescence
- Birth/6 months
IMPACT OF AUDITORY INPUT ON AUDITORY BRAIN DEVELOPMENT

- Neuroplasticity
- Competition in the brain
- Sensitive periods
Auditory development is impacted by spoken language input: Type – Amount – Quality
HEARING LOSS IMPACTS MANY CHILDREN
PREVALENCE OF PERMANENT CHILDHOOD HEARING LOSS

At birth:
- Hearing loss: 0.3%
- Cleft lip/palate: 0.1%
- Down syndrome: 0.1%
- Sickle cell anemia: 0.02%
- PKU: 0.01%

Childhood:
- Hearing loss: 5%
- Autism: 1%
- Down syndrome: 0.1%
- Cleft palate: 0.1%
- Blindness: 0.03%
TYPES OF HEARING LOSS

- Permanent
  - Abnormality of the outer/middle ear, inner ear and/or neural pathways
  - Unilateral or bilateral
  - Mild, moderate, severe or profound

- Temporary
  - Blockage in the outer or middle ear
  - Unilateral or bilateral
  - Typically mild
ETIOLOGY OF PERMANENT CHILDHOOD HEARING LOSS

- Genetic: 60%
- Environmental/acquired: 40%
IMPACT OF HEARING LOSS ON SPEECH AND LANGUAGE DEVELOPMENT

- Hearing loss sloping from mild to moderate
- Gray shaded area is not audible for this child
WHAT DOES HEARING LOSS SOUND LIKE?
It is important to know the type, degree, configuration and etiology of childhood hearing loss in order to properly manage it…

HOWEVER

This information does not necessarily predict the impact on speech, language, auditory development, or academic performance.

Any type or degree of hearing loss may affect development in childhood!!
WHAT DO YOU NEED TO KNOW ABOUT TREATMENT AND DEVICES FOR CHILDREN WITH HEARING LOSS?

- TREATMENT FOR TEMPORARY HEARING LOSS
- DEVICES FOR PERMANENT HEARING LOSS
- COMMUNICATION OPTIONS FOR CHILDREN WITH PERMANENT HEARING LOSS
MEDICAL TREATMENT FOR TEMPORARY HEARING LOSS

- Otitis Media = middle ear fluid:
  - The most common cause of temporary (conductive) hearing loss in children

- Treatment:
  - Antibiotics for acute otitis media
  - Tympanostomy ear tubes for fluid and hearing loss that persist for more than 3 months
Hearing Technology Devices

- Hearing aids
- Cochlear implants
- Hearing assistance technology

Intervention and education to support the child's communication development
HEARING AIDS

- Can be fit at any age
- Appropriate for most types/degrees of hearing loss
- Typically last for 5 years and can be re-programmed if hearing changes
COCHLEAR IMPLANTS

- Provide access to sound for children with severe to profound hearing loss who do not receive benefit from hearing aids
- FDA approved for ages 12 months and older
- Specific criteria for candidacy and surgery
HEARING ASSISTIVE TECHNOLOGY: FM SYSTEM

- **Rationale:**
  - Help overcome noise, reverberation, and distance
  - A compliment to hearing aids/cochlear implants

- **Technology:**
  - Teacher/parent wears a microphone/transmitter
  - Receiver on HA/CI

- **Use:**
  - Classrooms, out doors, and home activities

Is 80% enough?
To maximize communication development, learning, and educational outcome

- Early Intervention
- Parent education/support
- Educational support
COMMUNICATION CONTINUUM FOR CHILDREN WITH HEARING LOSS

Fully auditory Communicator
A
Listening & Speaking

Mostly auditory Communicator
Av
Signing & Speaking

Mostly visual Communicator
AV

Fully visual Communicator
Va
Signing Only

V
WHAT COMMUNICATION APPROACH IS “THE BEST”?  

- All communication approaches support successful communication  
- The “best” approach is the approach that supports the family’s communication goals for their child
HOW DOES HEARING LOSS IMPACT THE CHILDREN WE WORK WITH?
What factors influence the capacity for a child with hearing loss to reach his/her full potential?

What do different developmental trajectories look like in these children?

How can we limit the risk factors and enhance the protective factors to improve outcome in children with hearing loss?
Life Course Perspective on Childhood Hearing Loss

Age

Development

Protective Factors
Risk Factors
PROTECTIVE FACTORS

- Early auditory access
- Audibility of speech using hearing aids/cochlear implants
- High family involvement
- Intervention: timely and consistent support
- Strong cognitive/developmental abilities
RISK FACTORS

- Delayed auditory access due to late diagnosis
- Limited auditory access due to reduced use of hearing aid/cochlear implant
- Effects of challenging listening environments
- Additional developmental disabilities
- Less resourced family environment
Age

Normal Hearing Developmental range
Children with HL with good auditory access
Children with HL with limited auditory access
Children with late-identified HL
WHAT LIMITS THE OUTCOME OF CHILDREN WITH HEARING LOSS AND GOOD AUDITORY ACCESS?

- Children with early and good auditory access still have difficulty with:
  - Listening in noise
  - Language
  - Speech production
  - Listening effort
  - Self esteem

**Technology and intervention/education can maximize auditory access and maximize outcome but the impact of hearing loss cannot be eliminated.**
HOW CAN WE MAXIMIZE THE OUTCOMES?

- Early diagnosis
- Early and full access to sound with hearing technology devices worn full-time
- Rich language input
- Family involvement
- High quality early intervention
- Appropriate educational settings
HOW DO WE DETECT CHILDHOOD HEARING LOSS?
WHAT IS YOUR ROLE IN MINIMIZING THE IMPACT OF HEARING LOSS ON CHILDREN?

SCREEN FOR HEARING LOSS
HOW WE DIAGNOSE HEARING LOSS
MONITOR CHILDREN FOR SIGNS OF HEARING LOSS
DETECTING HEARING LOSS IN CHILDREN

- Regular hearing screenings at birth and throughout childhood
- Monitor developmental milestones
REGULAR HEARING SCREENINGS AT BIRTH AND THROUGHOUT CHILDHOOD

**Newborn Hearing Screening**
Before 1 month

**Medical Home Hearing Screening**
Age: 4, 5, 6, 8, 10 years

**School-Based Hearing Screening**
Grades: K, 1, 2, 3, 7, 11

**Speech & Language Milestones**
Monitor Continuously
Why is it important to continue to monitor hearing throughout childhood?

- Permanent hearing loss can develop at any age.
- Temporary hearing loss can occur at any age.
- Documentation of normal hearing throughout childhood is a documentation of good hearing health.
DETECTING HEARING LOSS IN CHILDREN: HEARING HEALTH HISTORY

Hearing Health History
Child’s Name: __________________________ Birthdate: __________________________

Newborn Hearing Screening
- Initial Screen
- Re-Screen (if Applicable)

Medical Home Hearing Screenings
Ages
- 4
- 5
- 6
- 8
- 10 years

School-Based Hearing Screenings
Grades
- K
- 1
- 2
- 3
- Middle School
- High School

NICU Graduates and Children with Risk Factors for HL
- Hearing Evaluation at 1 to 2 years of age

Surveillance of Milestones
Surveillance of speech/language and hearing milestones at:
- All well-child visits
- Clinical and school developmental assessment
HEARING LOSS CAN BE ACCURATELY DIAGNOSED AT ANY AGE USING A COMBINATION OF PHYSIOLOGICAL AND BEHAVIORAL METHODS

- Brainstem Auditory Evoked Response (BAER/ABR)
- Otoacoustic Emissions (OAEs)
- Visual Reinforcement Audiometry (VRA)
- Conditioned Play Audiometry (CPA)
- Conventional Audiometry
Families and professionals don’t notice what child is missing

“Wait-and-see”

Presence of other medical conditions

Challenges accessing pediatric audiology services from remote homes

Importance of follow up for a failed hearing screening is not emphasized
**RED FLAGS FOR CHILDHOOD HEARING LOSS**

**Infants and Toddlers**
- Delayed or limited babbling
- Inconsistent or limited responses to sound

**School-Aged Children**
- Inattentive/ Fails to follow directions
- Asks for repetition
- Exhibits language and/or articulation delays
- Strains to listen/ Favors one ear

**WARNING**
Responses to auditory stimuli may be difficult to assess – visual or vibro-tactile stimulation can be mistaken for auditory responses

**WARNING**
What the child is missing may be subtle and difficult to observe
WHAT CAN HEALTH PROFESSIONALS DO TO HELP CHILDREN WITH HEARING LOSS

- Be a “detective for hearing loss”
  - Help overcome barriers to detection and follow up
  - Look for red flags
- Support timely follow-up for infants and children who have not passed hearing screenings
- Support children’s full time use of hearing aids or cochlear implants
TOGETHER WE ARE AN INTERDISCIPLINARY TEAM!

QUESTIONS????