Pediatric Ear, Nose & Throat
of Atlanta, P.C.

Understanding Hearing Loss

404.591.1884
www.childrensent.com
Hearing Loss and Your Child

You just found out your child has a hearing loss.
You know what the Audiologist explained to you, but it is hard to keep track of all the new terms and information. You are not alone. There are many other parents and families like you that have embarked on this journey. Your concerns and questions are legitimate and real. This booklet is provided to help answer some of those questions and guide you through the process of choosing hearing aids and educational approaches for your child. Take your time and review the information in this booklet. Please feel free to ask questions of your child’s Audiologist at any time. You can call the Audiology department directly at 404.591.1884 or you may email us at audiologyservices@childrensent.com.

My Child’s hearing loss is:
Left ear:           Right ear:

_________________________________________________________________________________

How the ear normally functions to produce hearing.
In a typically functioning ear, sound waves travel from the environment to the outer ear. The sound waves then pass through the ear canal toward the middle ear where they cause the eardrum and three tiny bones (the ossicles) to vibrate. These vibrations move the fluid in the snail shaped inner ear (the cochlea). Thousands of tiny hair cells in the cochlea change the vibrations into electrical energy. This energy stimulates the hearing nerve, which sends signals to the brain.

Types of Hearing Loss
Hearing loss is classified according to the location of the problem in the hearing mechanism. There are three types of hearing loss: conductive, sensorineural, and mixed. Another type of hearing disorder is Auditory Neuropathy Spectrum Disorder (ANSD).
What is a conductive hearing loss (CHL)?
A conductive hearing loss is related to obstruction, disease, malformation, or damage in the middle or outer ear with sound transmission failing to reach the cochlea, or inner ear. Conductive hearing loss can be due to infection, injury or birth defects. Essentially, a conductive hearing loss results from outer and middle ear problems and is usually characterized by a loss of loudness with very little distortion. It is most common in children and often can be medically or surgically corrected. However, a hearing aid may be indicated if the loss cannot be corrected.

Some common causes of conductive hearing loss include:
- Atresia – absent pinna, or outer ear
- Otosclerosis – fixation of the middle ear bones
- Otitis Media – fluid in the middle ear
- Disarticulation of the ossicles – the middle ear bones are not connected properly
- Eustachian tube dysfunction
- Cerumen impaction – the accumulation of wax

What is a sensorineural hearing loss (SNHL)?
A sensorineural hearing loss is caused by disease, malformation, or damage of the inner ear and/or eighth nerve, or hearing nerve. This type of hearing loss is usually characterized by loss of loudness and distortion, making it difficult to understand speech. Hearing aids or cochlear implants are often appropriate forms of intervention.

Common causes of sensorineural hearing loss include:
1. Congenital – hearing loss may be present at birth, 50% of etiologies, or causes may be unknown.
2. Genetic/hereditary and syndromic – may or may not be present at birth, may also be progressive.
3. Measles, Mumps and Meningitis
4. Ototoxic medications – various drugs and cancer therapies
5. Noise induced trauma – examples include, but are not limited to: gun shots, explosions and prolonged exposure to excessively loud noise.

What is a mixed hearing loss?
A mixed hearing loss occurs when both conductive and sensorineural hearing components are present. Medical or surgical treatment and possibly hearing aids may be indicated with this type of hearing loss.

Your child’s mixed hearing loss can be treated with hearing aids, bone-anchored hearing implants, or cochlear implants.
Hearing Loss and Your Child

What is Auditory Neuropathy Spectrum Disorder (ANSD)?
ANSD occurs when the inner ear, or cochlea, functions normally, but an abnormality occurs in the transmission of signals from the cochlea to the brain. In these cases, the Auditory Brainstem Response (ABR) test will be absent or abnormal. Patients may be able to hear, but often experience difficulty understanding spoken words, particularly in noisy environments. Hearing loss can range from mild to profound and can be unilateral or bilateral. Amplification and/or cochlear implantation is often indicated in these patients. While the specific cause remains unknown, researchers believe a number of abnormalities may be responsible.

Those include:

• Damage to connections between the inner ear and the hearing nerve
• Damage to the cochlear nerve
• Damage to the auditory pathways in the brainstem

Close monitoring of these patients is necessary as wide variation exists between children diagnosed with Auditory Neuropathy Spectrum Disorder.
Understanding Unilateral Hearing Loss (UHL)

Children with UHL have normal hearing in one ear and a hearing loss in the other ear. Even though your child has normal hearing in one ear, he or she may experience challenges when listening and communicating. The following information is provided to help you understand the challenges your child may experience due to his or her diagnosis. Recommendations are provided to help you maximize your child’s success.

Studies have indicated that children with unilateral hearing loss are at risk for the following social-emotional difficulties:

- Inattentive and uncooperative behavior
- Social Withdrawal
- Aggression
- Difficulties with interpersonal and social adjustment
- Feelings of embarrassment, annoyance, confusion, frustration, and helplessness

Studies have indicated children with unilateral hearing loss are at risk for the following classroom difficulties:

- Repeating at least one grade in school
- Requiring resource room assistance
- A slight decrease in verbal intelligence quotient (IQ) scores relative to their overall performance IQ scores
- Exhibiting behavior problems in the classroom

Many parents and families successfully navigate this journey. You are not alone.
Understanding Unilateral Hearing Loss (UHL)

Recommendations for the management of children with UHL:

• Gain the child’s attention before initiating conversation or giving instructions.
• Provide preferential seating so the child’s good ear is towards the speaker and he/she is sitting away from any noise sources.
• Provide good lighting to maximize visual input.
• Use visual aids to facilitate learning.
• Check comprehension before changing topics.
• Use familiar vocabulary and less complex sentence structures.
• Rephrase statements that are misunderstood, rather than repeat verbatim.
• Minimize noise interference generated from within or outside the classroom.
• Talk with your child’s teacher about the above recommendations.

Recommendations to maximize your child’s hearing health and speech and language development:

• Have your child’s hearing tested at least annually.
• Be alert for middle ear infections as they can compound the negative effects of your child’s hearing loss.
• Always have your child wear ear plugs during activities with high levels of noise like rock concerts, fireworks, and mowing the lawn.
• Have your child’s vision checked periodically.
• Have your child’s speech, language, and academic progress monitored periodically.
• Talk with your audiologist to determine if a hearing aid or FM system is warranted.

Audiology Tests to Determine the Type and Degree of Hearing Loss

**Auditory Brainstem Response (ABR)**

**Age Range: All Ages**

Auditory brainstem response (ABR) testing provides information about the softest level of sound each ear responds to. During ABR testing, small band aid-style electrodes are placed behind each ear and on the forehead. Sounds are then presented to the ears using small earphones. The electrodes pick up responses from the hearing nerve and these responses are analyzed by your audiologist using a computer.

An ABR will provide you with an understanding of the type and degree of hearing loss your child has in each ear. This is also known as “Frequency-Specific ABR.”

ABR testing is the only test available for newborns and babies that can provide information about the softest level of sound each ear responds to. The ABR completed by your child’s audiologist is similar to the one used for newborn hearing screening in hospitals, however, the ABR completed by your audiologist gives more information about the amount of hearing loss that may be present at different pitches as well as determine the type of hearing loss.

**Newborns and babies up to 4-6 months:**
Testing can typically be performed while your baby is sleeping naturally.

**Babies over 4-6 months and older children:**
Sedation is usually required to obtain valid test results.

**Otoacoustic Emissions (OAEs)**

**Age Range: All Ages**

Diagnostic otoacoustic emissions are usually used in combination with ABR and hearing test results. A small earphone with a microphone is placed in the ear and tones are presented. The microphone then measures an echo response from the inner ear. This information helps define the degree of hearing loss your child has in each ear and aids in the diagnosis of ANSD.
Audiology Tests and Hearing Loss

**Visual Reinforcement Audiometry (VRA)**  
Age Range: 6 months to 2.5 years

With VRA, sounds are presented either through earphones or a loudspeaker. Your child learns to respond to sounds by looking at animated toys or videos that are paired with the sounds. Testing this way, it is possible to get information about your child's hearing across pitches in both ears or in the better hearing ear. Test results are graphed on an audiogram.

**Conditioned Play Audiometry (CPA)**  
Age Range: 2.5 years to 5 years

CPA uses a game activity every time a sound is heard. One example is having your child drop a block in a bucket when a sound is heard. Sounds are usually presented through earphones and results are graphed on an audiogram. By testing this way it is possible to get information about your child's hearing across pitches in both ears or in the better hearing ear.

**Standard Audiometry**  
Age Range: 5 years and older

In standard audiometric testing your child will raise his or her hand or press a button each time a soft sound is heard. Sounds are presented through earphones and results are graphed on an audiogram. Testing this way it is possible to get information about your child's hearing across pitches in both ears.

**Tympanometry**  
Age Range: All Ages

Tympanometry tests how the eardrum and middle ear are working. This test is important because fluid or other problems in the middle ear can affect hearing. During a tympanogram test, a small earphone is placed in the ear canal and air pressure is gently changed. This test is helpful in showing if there is an ear infection or fluid in the middle ear. Children whose tympanometry results indicate the presence of middle ear fluid will be referred to their pediatrician or an ENT physician for follow up.

*Adapted from www.babyhearing.org*
What is an Audiogram?

An audiogram is a chart that is used to plot hearing loss. The numbers across the top represent most of the frequencies, or pitches that humans hear. The numbers to the left are low-pitched sounds, such as a man’s voice. The numbers to the right represent high-pitched sounds, for example, a telephone ringing. The majority of speech sounds occur in the range of 500-4000Hz. The numbers down the side of the chart represent loudness and are defined by decibel level. The loudness increases as you go down the chart. Normal conversational speech occurs at approximately 55dB. A jet engine produces about 120dB of sound.

Hearing loss is expressed in categories, not percentages. It is not accurate to say that a person has a 50% hearing loss, rather it is defined as normal, mild, moderate, moderately-severe, severe, and profound.

When is hearing considered normal?

Hearing would be considered normal if results were found between 0 and 15dB. Responses below 20dB are considered as some degree of hearing loss; the further down the audiogram results are noted, the more severe the hearing loss.

<table>
<thead>
<tr>
<th>Level of Loss, measured in dB</th>
<th>Degree of Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 20 dB</td>
<td>Normal Hearing</td>
</tr>
<tr>
<td>20 - 40 dB</td>
<td>Mild Hearing Loss</td>
</tr>
<tr>
<td>40 - 55 dB</td>
<td>Moderate Hearing Loss</td>
</tr>
<tr>
<td>55 - 70 dB</td>
<td>Moderately Severe Hearing Loss</td>
</tr>
<tr>
<td>70 - 90 dB</td>
<td>Severe Hearing Loss</td>
</tr>
<tr>
<td>90 - 120 dB</td>
<td>Profound Hearing Loss</td>
</tr>
</tbody>
</table>

Once our Audiology team has completed your child’s testing, we will plot your child’s hearing loss as a line on the Audiogram. Sounds below this line can be heard by your child. Sounds above this line will be difficult to hear or inaudible to your child. Any of our Audiologists will be more than happy to discuss appropriate recommendations for treatment if a hearing loss is present.
The speech sounds on this chart are only approximations. Speech sounds become loud or soft (intensity) depending on the distance between the speaker and listener. The low or high sound of a voice (pitch) will change depending on whether a man, woman or child is speaking.

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