


TOOLS for SCHOOLS™
Program



**Becoming Familiar
with Cochlear
Implants**

Name
Title



Mission



At Advanced Bionics we are *dedicated* to improving lives by developing technologies and services that help our recipients achieve their full potential.

- Our commitment to putting patients first and providing the best possible hearing *performance* remains at the forefront of all that we do.
- The trust patients place in us inspires us to act with *integrity and transparency* as we strive for excellence each and every day in all that we do.


To learn more about Advanced Bionics visit [AdvancedBionics.com](https://www.advancedbionics.com)



TOOLS for SCHOOLS™

General Slide



Advanced Bionics



**PHONAK** | Partners for Better Hearing

TOOLS for SCHOOLS™

Speaker's Notes: AB is dedicated to helping people with hearing loss hear their best. Partnering with Phonak has allowed AB to offer unique technological advances to help people with hearing loss hear better in the most challenging listening situations.



Tools for Schools


Today's presentation is just one of many valuable FREE resources provided by Advanced Bionics' Tools for Schools™ program (TFS™).

The goal of the TFS program is to:

- Help school aged children with cochlear implants succeed in the classroom.
- Ease your workload and save you time.
- Educate parents and professionals about CI technology.
- Provide support for effective teaming between the School, CI center and Home.

Visit www.advancedbionics.com/tfs to learn more.

TOOLS for SCHOOLS™

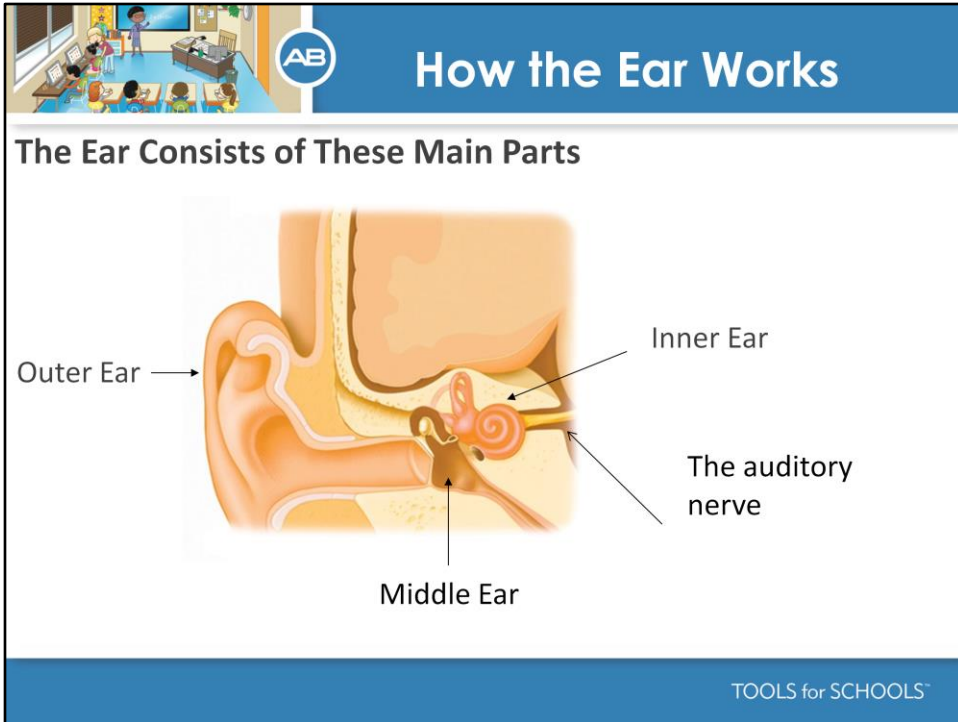


AB What You Will Learn Today

- **How the ear works**
- How to interpret the audiogram
- Types of Hearing Loss
- Treatment options for hearing loss
- Cochlear Implant Candidacy
- Cochlear Implant Basics
- Today's Cochlear Implant System
- Management of a child with a cochlear implant

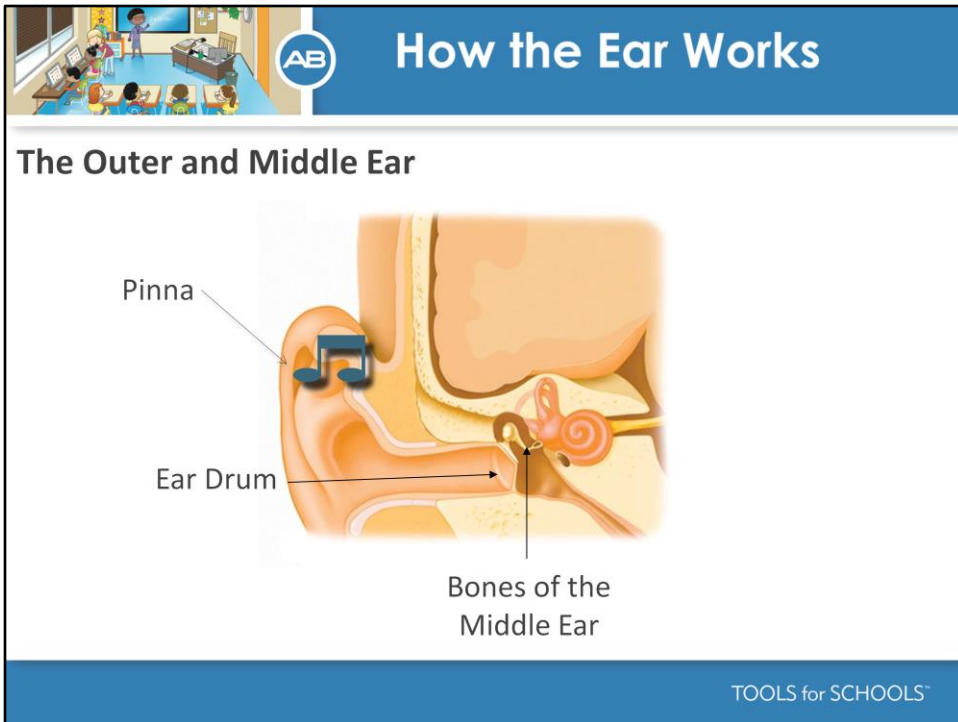
TOOLS for SCHOOLS™

Speakers Notes: Here are the topics we are going to discuss today.

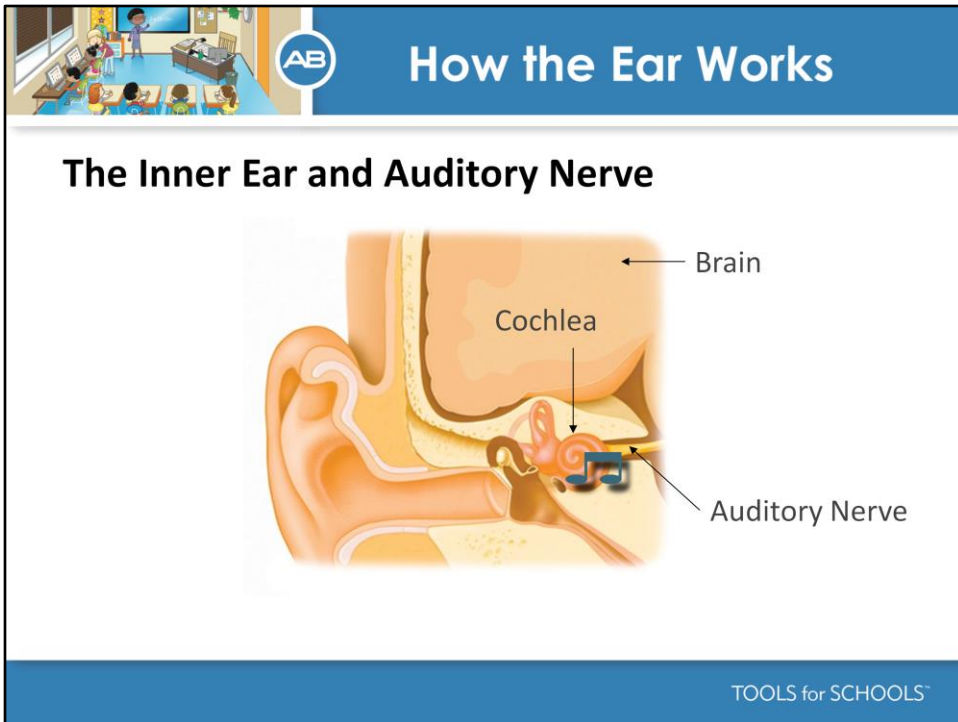


Speaker' s Notes:

There are three basic parts to the ear: 1. The outer ear or pinna which aids in the collection of sounds from the environment. 2. The middle ear which houses the tiny bones responsible for conducting sound to the inner ear sensory cells. 3. The inner ear which contains the cochlea and sensory cells for hearing and balance. 4. Finally the auditory nerve, or hearing nerve, which carries information, in the form of nerve impulses from the cochlea to the brain. Sensorineural hearing loss results most often from the lack of or damage to the inner ear sensory cells.





Speakers Notes: The process for hearing begins with the outer ear. Sound enters the ear canal via the outer ear pinna and travels as a sound wave down the ear canal striking the ear drum, also called the tympanic membrane, causing it to vibrate. Vibrations from the ear drum causes the tiny bones in the middle ear (malleus, incus, & stapes) to vibrate which then causes movement in the fluid of the cochlear in the inner ear.



Speakers notes: The inner ear cochlea contains thousands of sensory cells bathed in fluid. Sound in the form of vibrations from the middle ear enters the cochlea and causes movement in the fluid which causes changes in the motion of these sensory cells. As the cells move and change shape, they stimulate the auditory nerve. The pulses created by the sensory cells are carried to the brain's hearing centers for processing. The brain interprets these signals as sound.

When the sensory cells are missing or damaged, less or no information about sound can be conveyed to the auditory nerve. Severe to profound sensorineural hearing loss results when a large number of these cells are lost or damaged.





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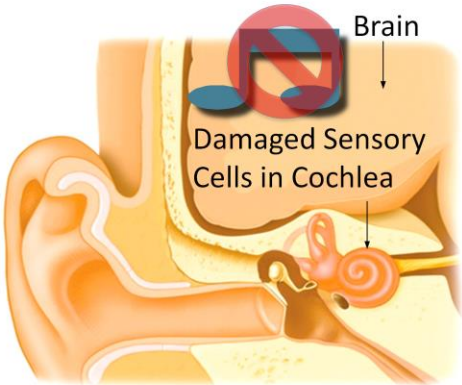
Speakers Notes: Now let's take a look at the audiogram.



How the Ear Works

Hearing Loss

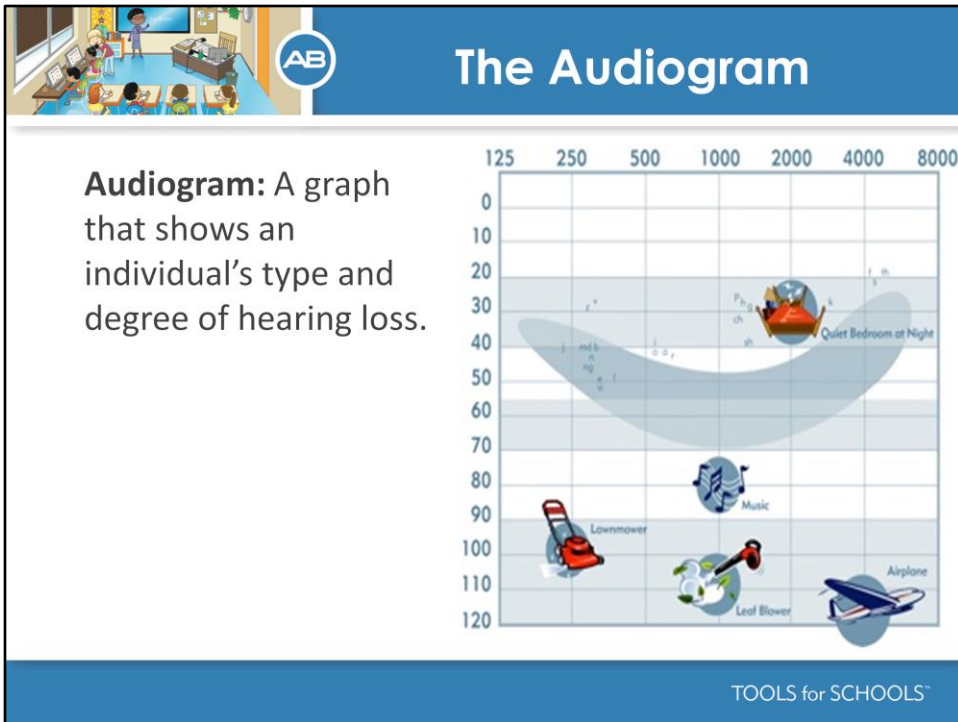
Without functioning sensory cells in the cochlea, sound information cannot reach the brain for processing



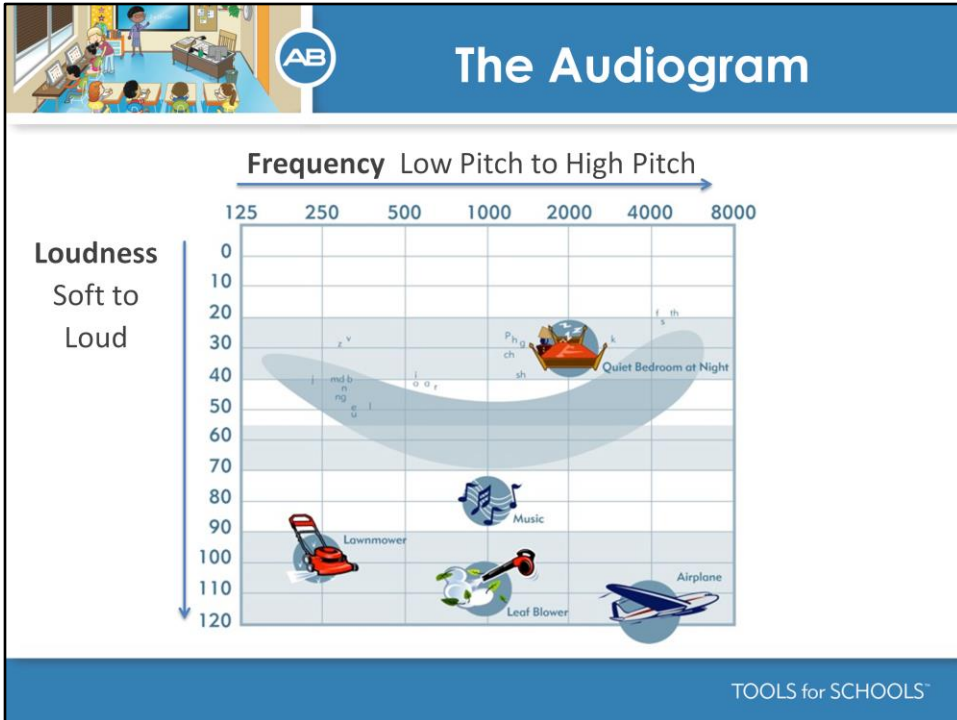
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Speakers Notes: Hearing loss involves damage to the sensory cells of the inner ear, referred to as a sensorineural hearing loss. Hearing losses will range in degree from mild to profound, depending on the extent of sensory cell loss or damage.

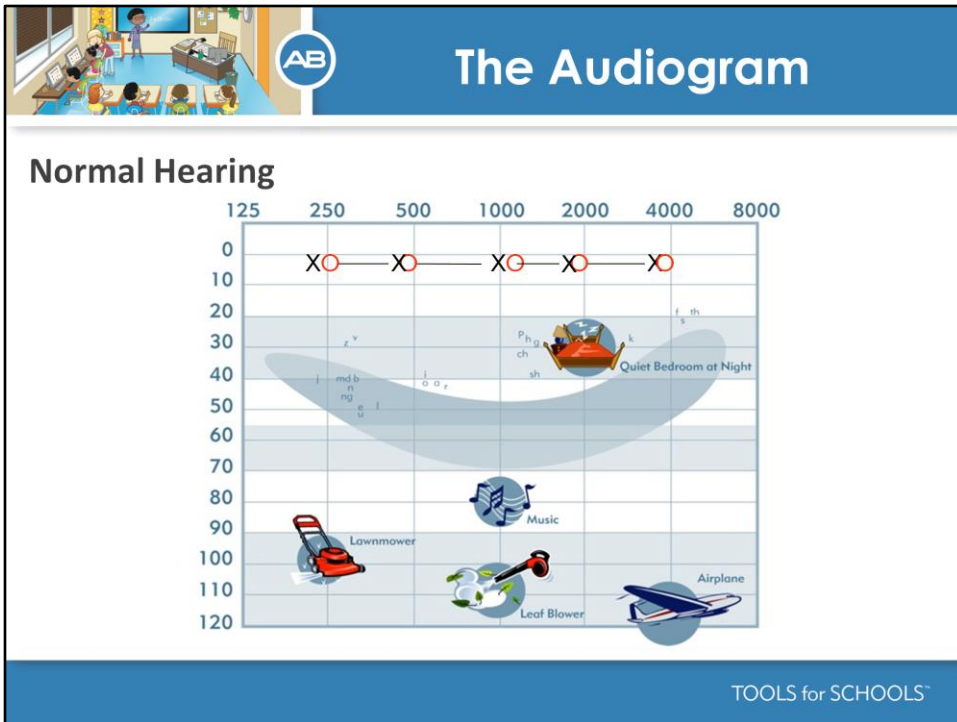
Damage to the sensory or neural structures result in a permanent hearing loss.



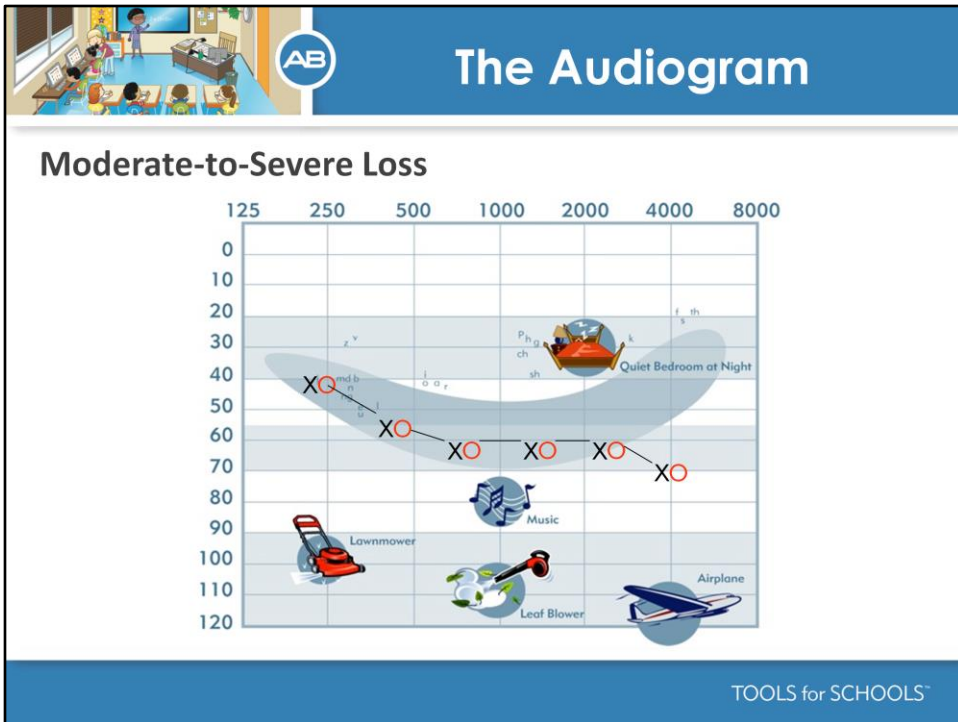
Speakers Notes: The audiogram is created during an evaluation for hearing. This is one of the tools in the battery of tests which an audiologist uses to evaluate the ear and hearing.



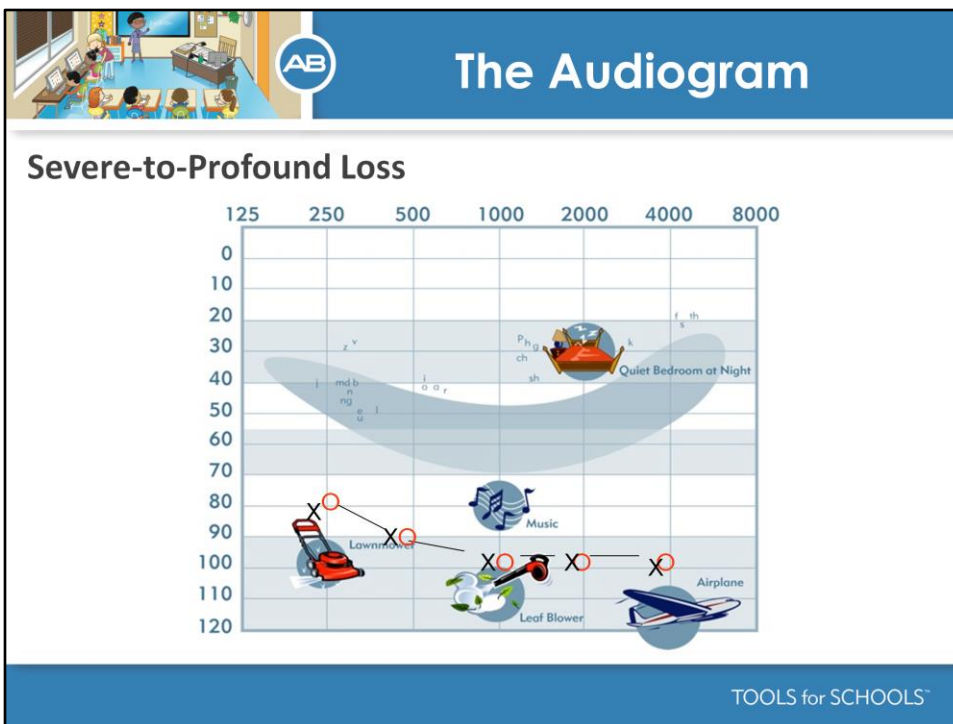
Speakers Notes: The audiogram is a graph which plots the softest level at which an individual **hears** a series of sounds, low pitch to high pitch. The top axis of the graph indicates the pitches, or frequencies, which are commonly tested by the audiologist. From left to right, the tones increase in pitch. Starting at the upper left corner and following the arrow down the side of the graph are the loudness levels, measured in dB. The smaller the number the softer the sound.




Speakers Notes: An individual who can hear normally, has responses on an audiogram which fall into the normal range of hearing, along the top of the graph. Generally, there will be separate markings for the right ('O') and left ears ('X'). Normal hearing is generally considered responses that are obtained at 20dB or lower.



Speakers Notes: A person has a hearing loss when responses are obtained at dB levels higher than 20. As the severity of hearing loss progresses the responses on the graph fall closer to the bottom of the audiogram.



Speakers Notes: An individual with a severe to profound hearing loss will have responses in the lower portion of the graph.





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Speakers Notes: Now let's discuss the different types of hearing loss.



Types of Hearing Loss

Sensorineural

damage to the inner ear (cochlea), or to the nerve pathways from the inner ear to the brain

Conductive

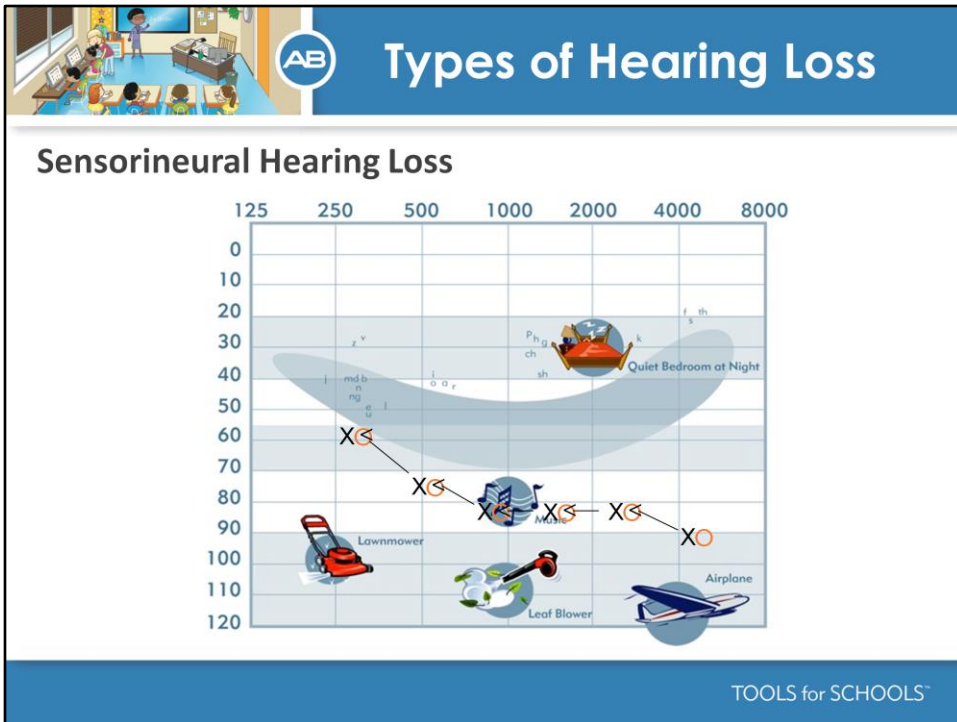
sound is not conducted efficiently through the outer ear canal to the eardrum and the tiny bones (ossicles) of the middle ear

Mixed

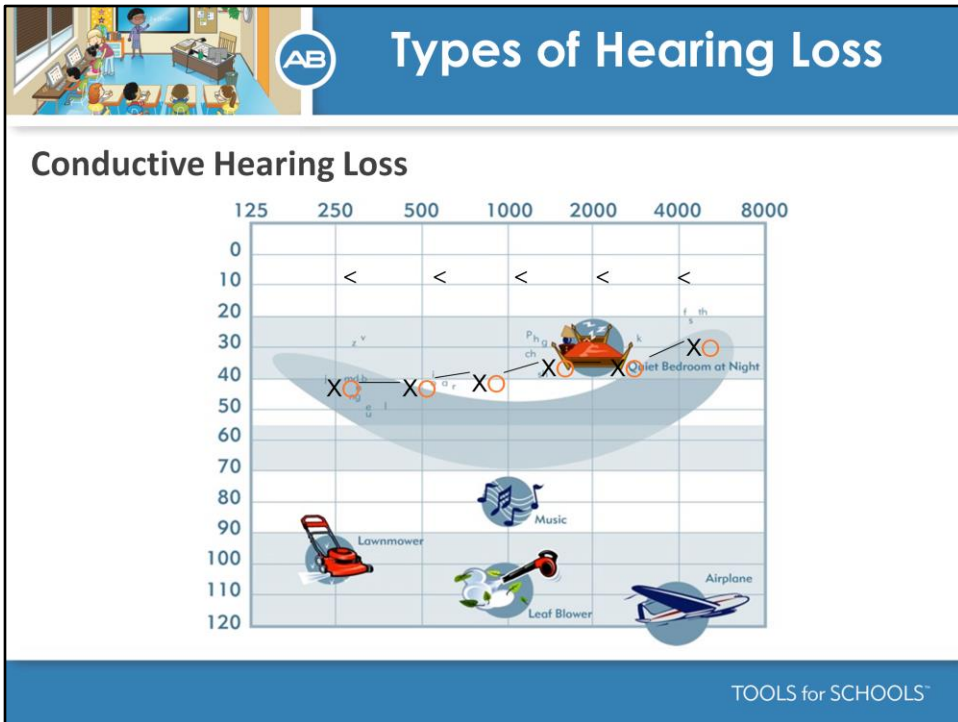
a conductive hearing loss occurs in combination with a sensorineural hearing loss

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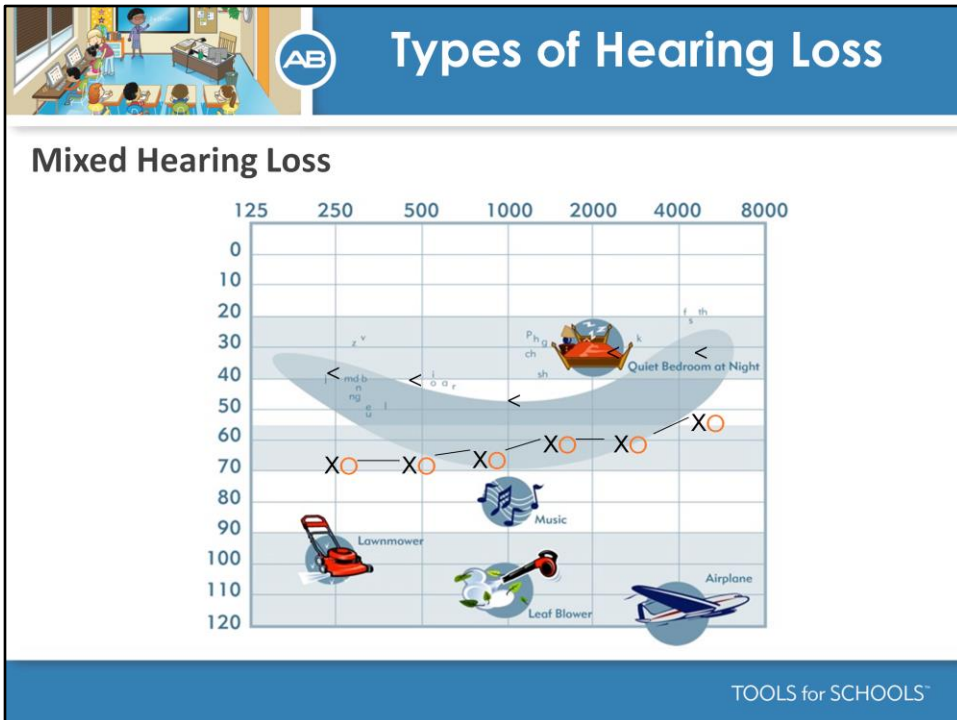
Speakers Notes: When we talk about a sensorineural hearing loss, we are referring to a loss of hearing function which occurs in the inner ear. There are other types of hearing loss as well, such as conductive and mixed hearing losses which involve the middle ear, this can be temporary or permanent. A conductive or mixed loss is not considered appropriate for treatment with a cochlear implant.




Speakers Notes: This is an example of a sensorineural hearing loss. Looking at the audiogram, you see the symbols for hearing which were described a few moments ago. There are added symbols represented by the carrot marks over the 'x' and 'o' markings. These represent bone conduction, or responses to sound presented via a special headphone **that** stimulates the cochlea directly. When all of the symbols line up, or there is no gap, then the loss is sensorineural and permanent.



Speakers Notes: This is an example of a conductive hearing loss. Here you see the bone conduction symbols actually fall within the normal range compared to the 'x' and 'o'. This might be the kind of audiogram that is found in a child with an ear infection. This child of course would not qualify for a cochlear implant.



Speakers Notes: Here is an example of a mixed hearing loss. You see here that the symbols for bone conduction are lower on the graph than what is considered “the normal range of hearing”. It’s possible for someone who has a congenital hearing loss to have periods of even poorer hearing, as highlighted in this graph. An example, which is common in children, is with the occurrence of an ear infection.



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Speakers Notes: Luckily there are treatment options for hearing loss.



Treatment Options for Hearing Loss





Hearing Aids



Cochlear Implants Systems


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Speakers Notes: Pictured here are two options for hearing loss. Different types of hearing aids and the HiResolution Bionic Ear cochlear implant system from AB.



Treatment Options for Hearing Loss



Types of Hearing Aids



The diagram illustrates three types of hearing aids. On the left, the text 'Behind-the-Ear' has a blue arrow pointing to three white, over-the-ear devices. Below this, the text 'In-the-Canal' has a blue arrow pointing to a small, clear, dome-shaped device. To the right of the 'In-the-Canal' device is a small, orange, custom-molded device. Below this orange device is the text 'In-the-Ear' with a blue arrow pointing up to it. To the right of the orange device is a white, over-the-ear device.

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Speakers Notes: There are different styles of hearing aids, typically the behind-the-ear hearing aid is utilized for more severe types of hearing loss and for children.

Treatment Options for Hearing Loss



How is a Cochlear Implant Different From a Hearing Aid?

Hearing Aid	Cochlear Implant
Acoustically amplify sound	Convert sound into electrical signals
Rely on the responsiveness of remaining undamaged inner ear sensory cells	Bypass the inner ear sensory cells and stimulate the hearing nerve directly

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Speakers Notes: The main differences between a hearing aid and a cochlear implant:

1. The hearing aid acoustically amplifies sound (makes it louder). The cochlear implant system, on the other hand, converts sound from the environment into electrical **signals** specific **to the implant recipient**.
2. The hearing aid relies on the remaining inner ear sensory cells to stimulate the hearing nerve. A more direct delivery of **sound** occurs with the cochlear implant as the electrical **signals** are presented to the hearing nerve, bypassing the inner ear sensory cells.

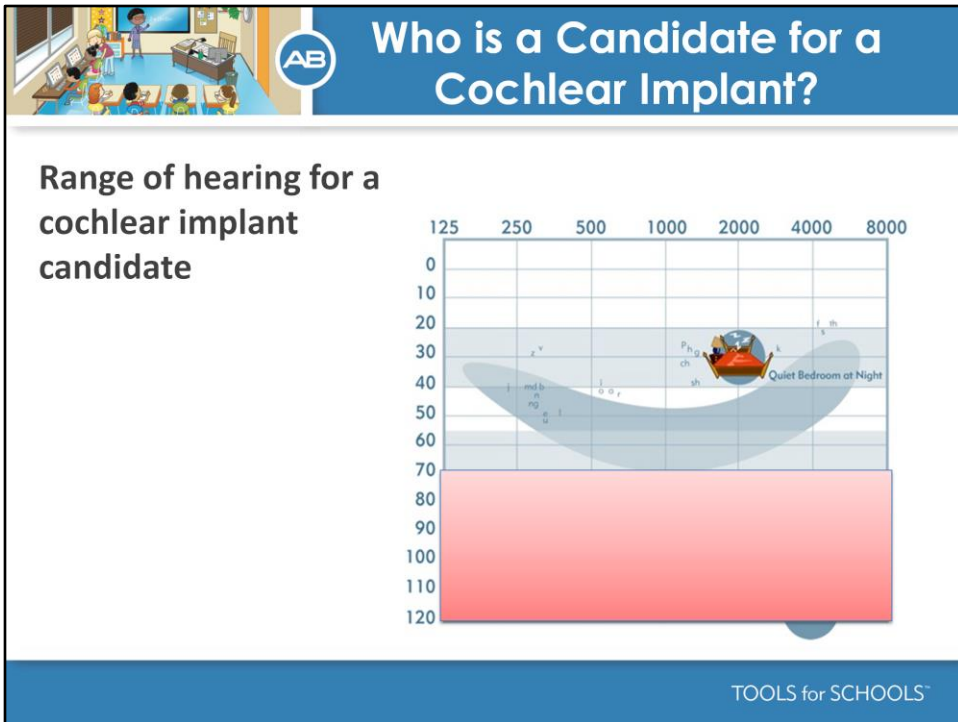


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Speakers Notes: How is cochlear implant candidacy determined



Speakers Notes: Adults and Children 12 months of age and older with severe to profound sensorineural hearing loss may be a candidate for a cochlear implant following an adequate trial period with conventional amplification.

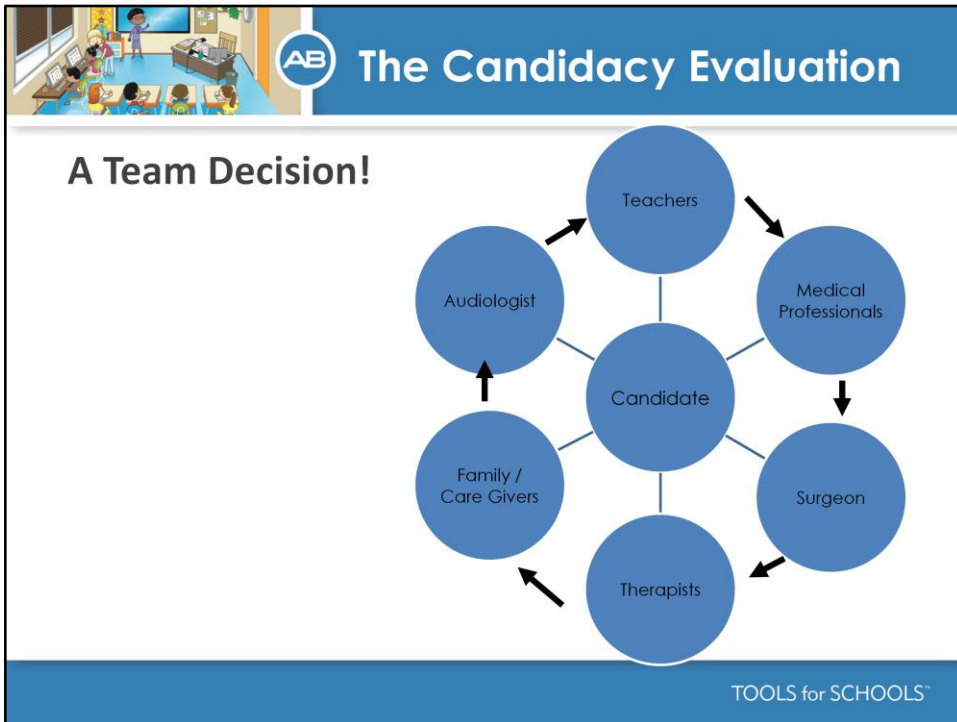


Who is a Candidate for a Cochlear Implant?



- Children (12 months - 2 years)**
 - Profound, bilateral sensorineural deafness (≥ 90 dB HL)
 - Little or no benefit from hearing aids
- Children (2 years - 17 years)**
 - Severe-to-profound, bilateral sensorineural deafness
 - Little or no benefit from hearing aids
- Adults (18 years+)**
 - Severe-to-profound, bilateral sensorineural hearing loss
 - Less than 50% speech recognition with hearing aids on open-set sentence recognition

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Speakers Notes: This is an outline of the current candidacy guidelines for a cochlear implant. These are only guidelines. Children are typically evaluated by a team and candidacy is determined on a case by case basis.




Speakers Notes: A team of professionals work together to evaluate and determine the right course of action for a child and their family. The team can include, but is not limited to: the surgeon, audiologist, speech-language pathologist, a psychologist, and, school professionals, and the caregivers.



The Candidacy Evaluation



Typical Components for Pediatric Evaluation

- Audiologic Evaluation
- Medical Evaluation
- Speech Language Evaluation
- Psychological Evaluation
- Educational Evaluation



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Speakers Notes: To determine candidacy for cochlear implantation, the child participates in a series of pre-cochlear implant evaluations. These may include, but are not limited to an audiologic evaluation by the audiologist, a medical evaluation by the surgeon, a speech-language evaluation by a speech language pathologist, a psychological evaluation by a pediatric psychologist, and an educational evaluation by a teacher.

The Candidacy Evaluation

Audiological Evaluation

Determine the type and degree of hearing loss


- Air & bone conduction thresholds for each ear
- ABR & OAEs

Assess the child's current amplification system

- Aided sound field testing
- Aided ear specific testing recommended
- Aided speech perception testing

Counseling



- Address realistic expectations
- Device selection
- Post-operative follow-up



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Speakers Notes: Now let's take a closer look at the cochlear implant evaluation. The audiologist will conduct several tests in order to best understand how the auditory system works. These tests take into account the child's behavioral response to sound, their development of speech/oral communication, and their ability to listen for and understand spoken language. During the evaluation, objective measures may also be performed if they have not already been done. These tests validate and clarify how the ear is processing sound.


A significant portion of the evaluation involves talking to the families. Many of these families are experiencing hearing loss in a child for the first time. During counseling sessions, parents are given tools to help their child be successful with their cochlear implant system: information, resources, and a mentors to connect with and share experiences. The Advanced Bionics BEA program assists families and individuals with connecting with another individual who has been through the cochlear implant experience.



The Candidacy Evaluation



Medical Evaluation

- Determine the cause of hearing loss
- Assess status of middle ear & cochlea
- CT scan/MRI
- Counseling
 - Hearing loss
 - The surgical procedure
 - Typically out-patient and performed by an otolaryngologist (ENT) or otologist (ear specialist)
 - Post-surgical considerations



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Speaker Notes: The medical evaluation includes these components. Families are encouraged to discuss the surgical procedure with their surgeon, as well as any concerns regarding their child.




The Candidacy Evaluation

Bilateral Cochlear Implants

Bilateral Implants (one for each ear)



- Hearing with two ears
- Simultaneous vs. Sequential
- Benefits:
 - ✓ Improved directionality
 - ✓ Improved hearing in noise
 - ✓ Clarity of speech
 - ✓ Developmental



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Speakers Notes: Bilateral cochlear implants, one for each ear, is becoming more common for both children and adults. This is due in part to the remarkable success and advancements to date with implant technology. We now know that children implanted early have the potential to progress quicker and to a more sophisticated level with their hearing (Robbins et al. 2004) than those implanted later. In addition, there are indications that children receiving two cochlear implants may be able to develop listening skills which aid them in understanding speech in noise, locating a sound source, and incidentally learning from their environment. (Litovsky, 2006; Wolf, 2008)

A bilateral cochlear implant can be done as a simultaneous procedure (both implants placed in the same surgery) or as a sequential procedure (an implant placed in each ear over two separate surgeries). For children, even with a delay of several years between placement of the two implants, benefits can be significant.





The Candidacy Evaluation

Speech & Language Evaluation



- Assess Vocabulary - knowledge of single words**
 - Understanding words
 - Using words
- Assess Language - communication**
 - Understand what is spoken
 - Using spoken words
- Assess Speech- using sounds to form words clearly**
- Assess Listening skills – making sense of sounds and voice**
- Assess Reading skills**

Counseling on consistent use of amplification and communication expectations pre-CI and post CI



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Speakers Notes: Throughout the evaluation, the child is being evaluated for their ability to develop listening, communication, and speech through hearing. In the speech & language evaluation, the child is evaluated for their abilities based on their age. A child who is not maintaining adequate progress in development may be considered a cochlear implant candidate. These results are used as baseline measures for comparison to chart progress during the time after the child has received the cochlear implant.



The Candidacy Evaluation

Developmental Evaluation

Assessment of non-verbal & verbal IQ

- Verbal IQ assessed when appropriate


Counseling for family

- Impact of hearing loss on the family unit

Assessment of child's learning style



Assessment of any other underlying issues

Serves as a baseline evaluation



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Speakers Notes: The psychologist is an important member of the cochlear implant team. Children with hearing loss are at high risk for coexisting developmental and/or medical issues. The developmental evaluation gives the team information on how the child learns best, areas of development which need to be addressed for the child to be successful, educational recommendations, and provides support to the family.




The Candidacy Evaluation

Educational Evaluation


Areas to consider:

- Communication methodology
- Support services
- Speech/language and auditory skill development
- Professional training



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Speakers Notes: Each child has a unique set of skills and challenges. The cochlear implant is a method to provide the child with access to sound and the rehabilitation & education which follow are the means to which the child closes gaps in development. The educator, who has specialized training in education of children with hearing impairments, determines how to best meet the child's needs for success in school by evaluating the child's strengths and assisting with recommendations for classroom placement to support chosen communication methodology and any additional support services that may be needed. The educator will be key in facilitating professional training for those children who may enter the mainstream classroom.





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- Management of a child with a cochlear implant





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Speakers Notes: Let's move on and talk about how a cochlear implant functions.



Cochlear Implant Basics

A cochlear implant system consists of two main parts:


or

Internal Implant

External Sound Processor

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Speakers Notes: Unlike a hearing aid, the cochlear implant system requires two components to function– an internal **implant** and an external sound processor.





Copy this link into your browser to view a video on how a cochlear implant works.

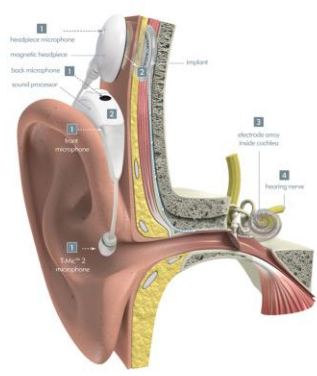
<https://www.youtube.com/watch?v=zeg4qTnYOpw>

Or visit YouTube and search for “How a Cohlear Implant Works by Advanced Bionics”

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Cochlear Implant Basics



Sound Processor (1)

- Captures sound from the environment
- Processes sound into digital information
- Transmits information across the skin through the headpiece to the implant

Implant

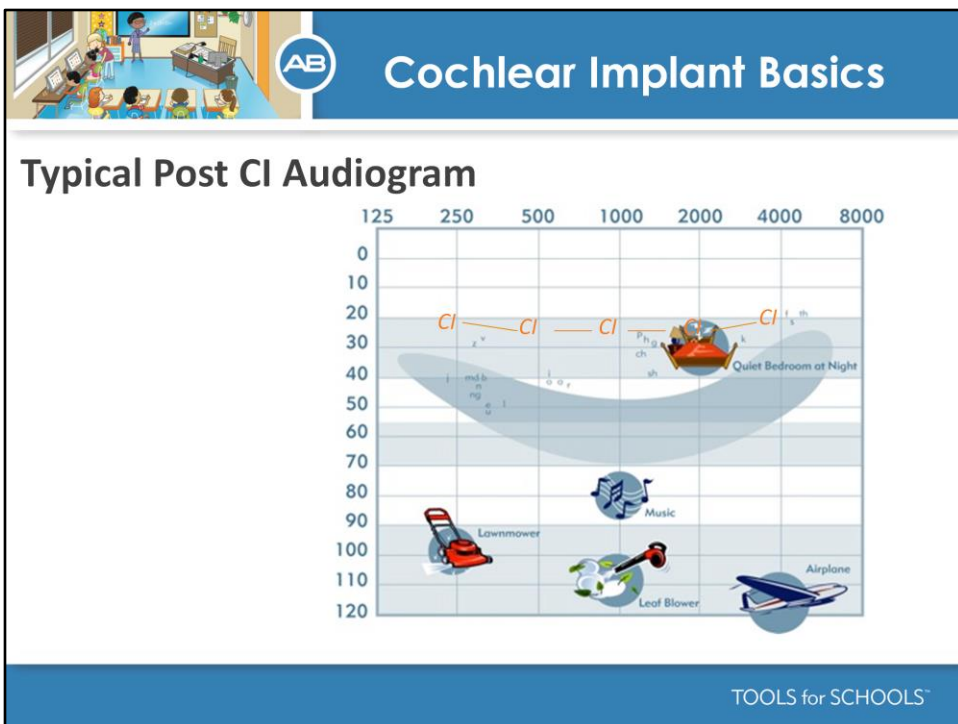
- Converts transmitted information into electrical signals (2)
- Delivers signals to the electrodes (3)
- Stimulates the hearing nerve

Hearing Nerve


- Transmits the signal which will be perceived by the brain as sound (4)

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Speaker' s Notes: Here is summary of how a cochlear implant works.



Speaker' s Notes: This is a typical audiogram for a child after they have received and practiced using his/her cochlear implant.




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Speakers Notes: Let's learn a bit about today's cochlear implant system



Today's Cochlear Implant System

Internal Device

The HiRes 90K™ Advantage Implant





- Unlimited ways to deliver stimulation
- 16 independent current sources
- Low-profile design
- Removable magnet
- Industry's highest case impact resistance- up to 6 Joules^{1,2}
- Industry's fastest stimulation rates

1. Holikamp V. Cochlear Implants Under Impact Loading. Evaluation of Accident Scenarios. Determination of Load Limits, and Development of a Standardizable Test Procedure. Dissertation accepted by the Senate of Hannover Medical School, May 19, 2004.
 2. Cochlear Nucleus C512 Cochlear Implant Technical Specifications. N33741F 1st Jun09.

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Speaker's Notes: This is the internal device that a surgeon places during surgery.

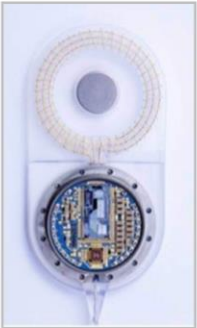


Today's Cochlear Implant System

High Implant Reliability HiRes 90K™ Advantage Implant

AB cochlear implants implanted today demonstrate high reliability with a 99.81% two-year cumulative survival rate (CSR)*.

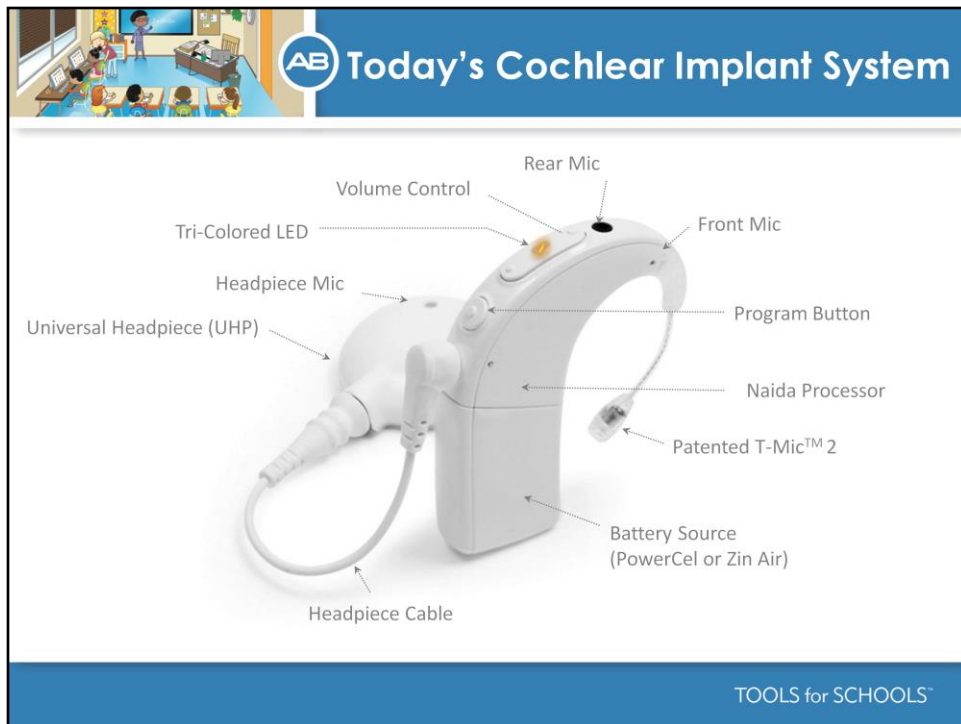
Advanced Bionics reports all device failures in adherence to the global standard as defined by ISO 5841-2:20141 and the principles outlined in the European & Global Consensus on Cochlear Implant Failures and Explanations



* Advanced Bionics Technology and Reliability Report, 2015.


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Speaker's Notes: Of course, a reliable implant is very important.... CSR is a measure that defines the likelihood of a device continuing to function over time. The HiRes 90k Implant Reliability at 2 years for the today's device is 99.81%.



Speaker's Notes: Let's start by reviewing the components of the Naida CI.

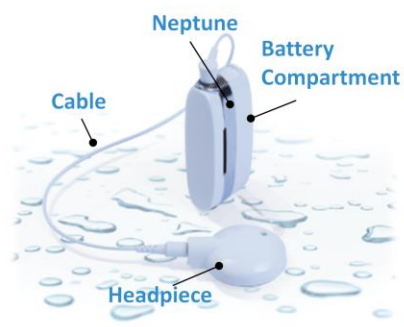
1. Here is the Naida Processor.
2. At the bottom of the processor is the power source. Here you see one of the Power Cel rechargeable batteries. You can also use a Zinc-Air cartridge that holds 2 high powered 675 cochlear implant disposable batteries.
3. Here you can see the Universal Headpiece (UHP) and the headpiece cable.
4. The round button located near where the UHP attaches to the processor is the Power Button.
5. The Volume Control is located directly above.
6. You can see here that the Naida's LED is located in the center of the volume control.
7. There are also several microphones on the Naida processor. The front and rear microphone as well as the T-Mic and headpiece mic.



AB

Today's Cochlear Implant System

Neptune™ Processor Features



- Waterproof
- Removable Controls
- Powered by 1 AAA Battery
 - Cost Effective
 - Full day of use with a single disposable or rechargeable battery
- Universal Headpiece (UHP) and AquaMic
- Compatible with HiRes 90K™ and CII implant devices



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Speaker's Notes: Neptune has many user friendly features including diagnostic indicators in the form of LEDs and Audible Alarms that are available with programmable options, easy to use detachable controls, wireless FM, audio input, head piece microphone check, and the ability to provide natural hearing using AB's T-mic with the T-Comm accessory.

When you remove the controls to make Neptune waterproof, the processor remembers where they were set and continues to function at those settings. The Neptune is powered by one rechargeable or disposable AAA battery. This allows more than a full day's use on one charge & providing a cost-effective, practical solution.

For water use, AB has the "AquaMic", a waterproof headpiece. And for other situations, a slimmer, lower profile design, called the "Universal Headpiece" or UHP can be used with Neptune and any AB processor.

Neptune is compatible with the CII or 90K implants, so anyone implanted within the past 10 years (since 2001) would be eligible to upgrade.





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- **Maximizing success with a cochlear implant**


TOOLS for SCHOOLS™

Speakers Notes: Receiving a cochlear implant is only the first step in a long journey. Let's discuss what components are necessary to maximize success with a cochlear implant.



Maximizing Success

- Audiologic Management
- Rehabilitation
- Family Support
- School Support



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Speakers Notes: Follow up to the cochlear implant is provided by a team of individuals.



Maximizing Success

Audiologic Management

- Goal is to assure access to sound adequate for auditory development
- Programming or “mapping” of the cochlear implant system
- Assessments at regular intervals to track auditory development
- Age-appropriate techniques & materials



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Speakers Notes: The goal of the audiologist is to assure that that the cochlear implant **system** is providing access to sound which is sufficient for the development of auditory skills. Age appropriate toys, assessment techniques, and evaluation materials are utilized. In addition to behavioral observations, parent report, and testing in the sound booth; the audiologist has a several objective tests to assist in programming the cochlear implant system.



AB Maximizing Success

Rehabilitation is KEY



TOOLS for SCHOOLS™

Speakers Notes: Once the child has access to sound with a cochlear implant, a treatment plan is required to help that child close the gap in development which may exist between their chronological age and their auditory and communication development age. Parents work with speech language pathologists, auditory verbal therapists or teacher's of children with hearing loss to evaluate, develop and monitor progress towards developing listening and spoken language. Therapy programs focus on learning how to listen with the sound processor and developing age appropriate listening and communication skills. Children are developing auditory skills well into their teen years. Rehabilitation and support often continue on into high school.





Maximizing Success

Parent Commitment



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Speakers Notes: Parents are an integral component of a child's success following the cochlear implant. Families require the support of professionals to meet the needs of their child.



Maximizing Success

School Support

- Understand what a cochlear implant is and how to complete equipment troubleshooting
- Provide an environment where there are strong expectations for listening and spoken language
- Perform behavioral listening checks on a daily basis
- Know where to find support and resource materials
- Maintain communication between the student's parents, teachers and cochlear implant center



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Speakers Notes: Once the child begins school, the teacher, hearing itinerant teacher, therapists, and audiologist work together to assure that the child has optimal access to sound. This includes understanding the cochlear implant equipment, communication, and management of the classroom environment.




AB Makes it Simple for Schools

FREE resources!!


www.advancedbionics.com/tfs







TOOLS for SCHOOLS™

Speaker's Notes: AB Makes it Simple for Schools! Take advantage of all the free resources offered by the Advanced Bionics Tools for Schools Program. Visit www.Advancedbioincs.com/tfs

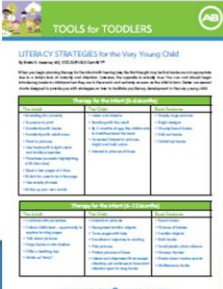






Tools for Toddlers™ Program

Do you know about Advanced Bionics' Tools for Toddlers program (TFT™)?

TFT provides free resources created specifically to help support early intervention and pre-school aged children.







Visit the Tools for Toddlers Program at
www.advancedbionics.com/tfs
TFT resources can be found on the lower section of the TFS page

TOOLS for SCHOOLS™



AB Makes It Simple for Schools

Additional FREE Resources

- www.hearingjourney.com
- www.thelisteningroom.com
- www.advancedbionics.com/bea
- www.advancedbioinics.com
 - Take free courses
 - Learn about products
 - Watch videos
 - Download materials and resources
 - Connect with others



BEA
Bionic Ear Association



rehAB
AB's global rehabilitation & educational programs



The Listening Room
www.BionicEar.com

HEARINGJOURNEY™

TOOLS for SCHOOLS™



Speakers Notes: Advanced Bionics has several other resources and programs to assist you.

HearingJourney.com is an online forum for people to chat, laugh, and share stories about cochlear implants and hearing loss.

The Listening Room is a rehabilitation site where you will find a host of free, fun activities and resources to support the development of speech, language, and listening skills in people of all ages with a hearing loss.

The BEA is a community of recipients, candidates and professionals who connect to promote the benefits and optimal use of cochlear implants and Advanced Bionics technology.

And you can always visit www.advancedbionics.com for materials, resources, and information.



Resources & Support

For Educators, Therapists, Recipients, and Families


Online:


Live Chat: [AdvancedBionics.com](https://www.advancedbionics.com)


Customer Care:

Speak with an audiologist:
Toll Free Phone: 1-877-829-0026
TTY: 1-800-678-3575

Email Questions:
CustomerService@AdvancedBionics.com
ToolsForSchools@AdvancedBionics.com
Monday through Friday, 5 am to 5 pm PST

**Make Connections**
Call toll free 866.844.4327

Live Chat

Customer Service

TOOLS for SCHOOLS™

Speakers Notes: Finally support is always available. Discover resources and support services online or by phone.



***Education and rehabilitation
are keys to success with a
cochlear implant***



Visit Advanced Bionics online today at
[AdvancedBionics.com](https://www.advancedbionics.com)

TOOLS for SCHOOLS™

Speakers Notes: Find out why **AB** is the best choice for children with severe to profound sensorineural hearing loss at **AdvancedBionics.com**.