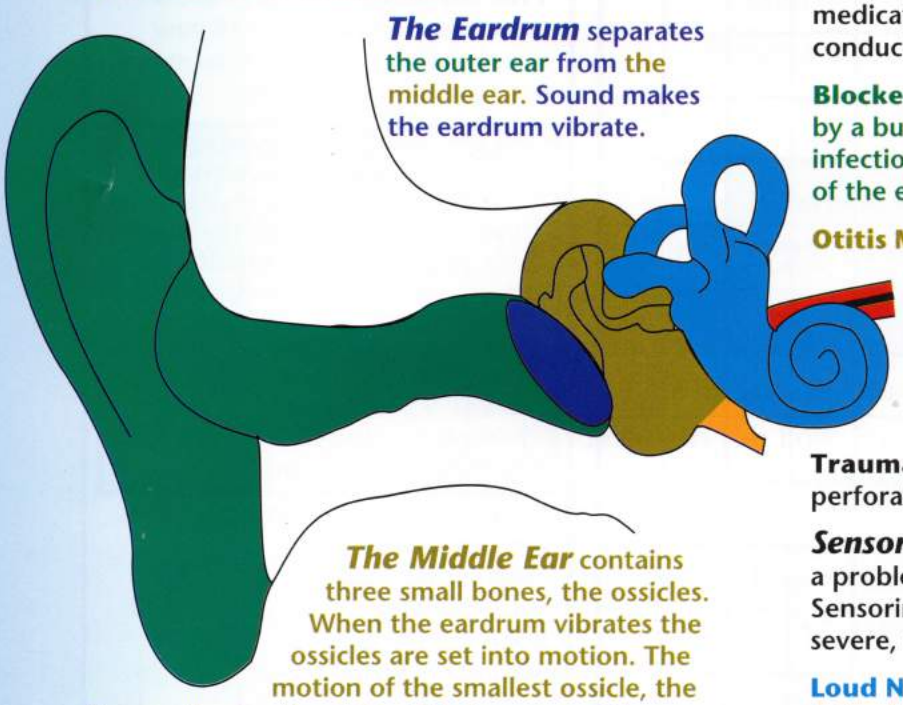
UNDERSTANDING YOUR HEARING©

How the Ear Works

The Outer Ear includes the pinna and ear canal. The outer ear is a pathway for sound to reach the inner structures of the ear. Besides providing a pathway, the outer ear boosts high frequency sounds. By boosting the important high frequency sounds in speech, the outer ear makes speech easier to understand.



The Eardrum separates the outer ear from the middle ear. Sound makes the eardrum vibrate.

The Middle Ear contains three small bones, the ossicles. When the eardrum vibrates the ossicles are set into motion. The motion of the smallest ossicle, the stapes, vibrates the fluid of the inner ear. The ossicles are suspended in a closed space that is filled with air. The eustachian tube connects the middle ear with the back of the throat. The eustachian tube opens when you swallow relieving pressure that can develop in the middle ear.

The Inner Ear contains the sense organ of hearing (the cochlea), the organs of balance, and the auditory nerve. The cochlea contains the hair cells which have tiny hairs projecting from their tops. The hair cells change sound into electric signals that stimulate the auditory nerve. The auditory nerve takes the information to the brain where the interpretation of sound occurs.

Hearing loss can be caused by a problem in the outer ear, the middle ear, or the inner ear. Hearing loss can be temporary or permanent. There are many degrees of hearing loss. The degree of your hearing loss is shown by the audiogram on the next page. Sometimes both ears are affected (bilateral hearing loss). Sometimes only one ear is affected (unilateral hearing loss).

Causes of Hearing Loss

Conductive Hearing Loss occurs when sound cannot reach the inner ear because of a problem in the external or middle ear. External and middle ear problems can cause mild or moderate hearing losses. Severe and profound losses are never caused by external or middle ear problems. Most conductive hearing losses can be treated with medication or with surgery. Common causes of conductive hearing loss are:

Blocked Ear Canal. The ear canal can be blocked by a buildup of cerumen (ear wax), swelling due to infection (external otitis), or an abnormal growth of the ear canal wall.

Otitis Media (middle ear infection) is the most common ear problem in children and occurs occasionally in adults.

Otosclerosis is caused by a bony growth around the stapes that prevents it from vibrating, causing a moderate hearing loss.

Trauma to the ear can cause hearing loss by perforating the eardrum or disrupting the ossicles.

Sensorineural Hearing Loss results from a problem in the inner ear or auditory nerve. Sensorineural hearing loss can be mild, moderate, severe, or profound.

Loud Noise causes hearing loss by destroying the hair cells of the inner ear. People who are exposed to loud sound on a regular basis are most at risk. Sources of frequent loud noise exposures include noisy workplaces, firearms, recreational noise (snowmobiles, motorcycles), and loud music.

Aging causes a gradual loss of hearing (*presbycusis*). By age 65 about 50% of healthy people have hearing loss. Presbycusis results from deterioration of the inner ear.

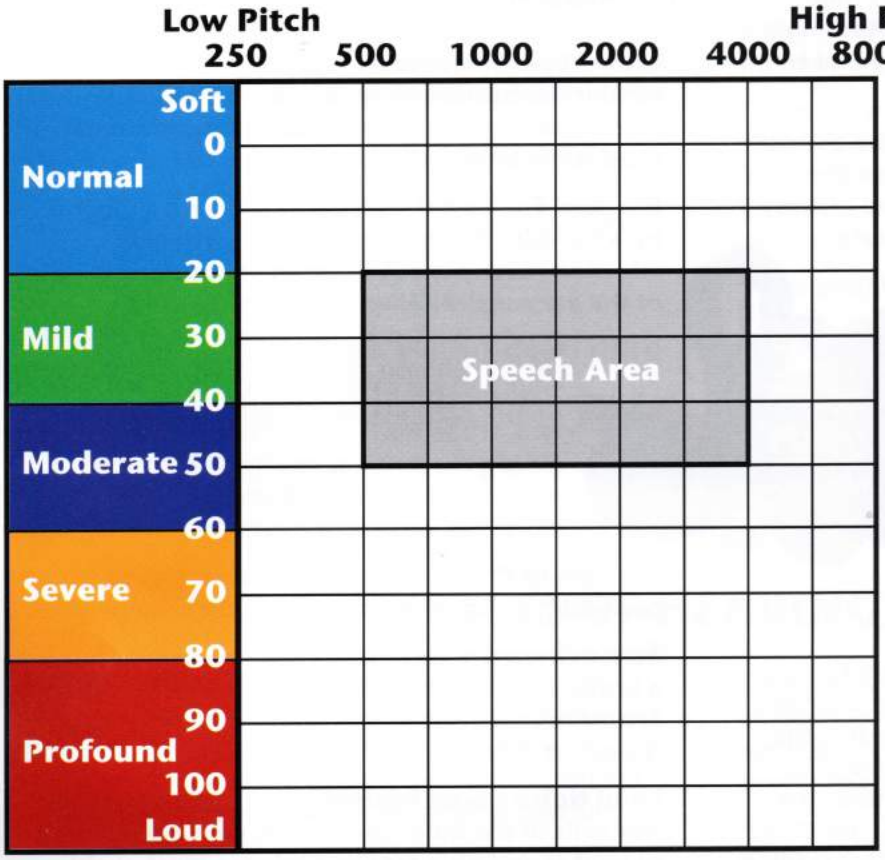
Inner ear infection can occur by itself or in conjunction with an illness like a "cold" or the flu.

Meniere's disease is an inner-ear condition that causes fluctuating hearing loss, dizziness, and *tinnitus* (ringing in the ears). It frequently starts in one ear and later can involve both ears.

Mixed Hearing Loss occurs when there is a problem in the inner ear and a problem in the external or middle ear. The two problems may be unrelated (for example, a blocked ear canal and a noise-related hearing loss) or they may be caused by the same thing (for example, infection).

THIS IS YOUR AUDIOGRAM

The audiogram is a graph that shows your *thresholds* for the sounds that were used to test your hearing. A threshold is the softest level of the sound that you can hear. Across the top of the audiogram are the *frequencies* (pitches) that were tested, low frequencies toward the left and high frequencies toward the right. The frequencies that are tested represent the range of sounds that we have to be able to hear for everyday living. Down the left side of the audiogram are the sound intensities (in decibels, dB), soft sounds at the top and loud sounds at the bottom. The lower the mark on the audiogram, the louder it has to be for you to hear it.



The normal range is at the top of the audiogram. If all your thresholds are in the normal range, you have normal hearing.

The speech area represents the sounds that make up everyday conversational speech. If your thresholds are all above the speech area, you hear all the sounds that are important for understanding speech. If your thresholds are all below the speech area, you hear none of the sounds in normal speech. If your audiogram cuts through the speech area, you can hear some of the sounds in speech.

SYMBOLS	Right	Left
Air Conduction		
without masking	O	X
with masking	△	□
Bone Conduction		
without masking	<	>
with masking	[	]

There are two ways to test hearing— air conduction and bone conduction.

Air-conduction testing is performed with earphones that vibrate the air in the ear canal. This is the normal way we hear sounds. Sounds that are in the air travel through the ear canal to the eardrum.

Bone conduction testing is performed with a vibrator behind the ear. Bone-conducted sound travels through the head to the inner ear. We hear our own voice by bone conduction.

Sometimes masking noise is presented to the other ear to be sure it is not hearing the test tone.

Hearing losses can be described by how loud sounds have to be before you can hear them. The audiogram can be divided into regions that show how much hearing loss you have.

Mild Hearing Loss causes difficulty understanding speech especially in difficult listening situations (soft speaker, noisy room, distant from speaker). People with mild hearing loss can usually understand conversation in a quiet room if they are near the speaker. Some people with mild hearing loss are helped by hearing aids. Others get by without hearing aids.

Moderate Hearing Loss causes difficulty understanding speech in all normal conversations. Most people with moderate hearing loss get significant benefit from hearing aids.

People with **Severe Hearing Loss** cannot hear normal conversational speech at all. Most people with severe hearing loss benefit from hearing aids but many have difficulty understanding even with properly-fitted hearing aids.

People with **Profound Hearing Loss** cannot hear speech. They are usually not able to understand speech with hearing aids. Hearing aids are helpful for awareness of environmental sounds like traffic noise, alarms, and loud speech.

Sometimes the hearing loss may be greater for some frequencies than for others. High-frequency hearing loss is a very common pattern. Hearing may be normal for low frequencies with a mild, moderate, severe or profound loss for high frequencies.

YOUR HEARING LOSS IS

Right ear	Type of Hearing Loss	Left ear
☐	Normal	☐
☐	Conductive	☐
☐	Sensorineural	☐
☐	Mixed	☐
	Degree of Hearing Loss	
☐	Mild	☐
☐	Moderate	☐
☐	Severe	☐
☐	Profound	☐
	Shape of Hearing Loss	
☐	Flat Hearing Loss	☐
☐	High-Frequency Hearing Loss	☐
☐	Normal in the Low Frequencies	☐
☐	Mild in the Low Frequencies	☐
☐	Moderate in the Low Frequencies	☐
☐	Mild in the High Frequencies	☐
☐	Moderate in the High Frequencies	☐
☐	Severe in the High Frequencies	☐
☐	Profound in the High Frequencies	☐
☐	Other_____	☐

The probable cause of your hearing loss is _____

Possible causes of your hearing loss are _____

_____

_____

RECOMMENDATIONS

- ☐ Consult with primary care physician: Dr. _____
- ☐ Consult with otolaryngologist (ear specialist): Dr. _____
- ☐ Return for hearing test if hearing changes _____
- ☐ Annual hearing tests _____
- ☐ Consult audiologist for hearing aid consultation _____
- ☐ Other _____
- ☐ Other _____
- ☐ Other _____

Patient Name _____ ID# _____

Date of Evaluation _____

Audiologist / Otolaryngologist _____

TREATMENT FOR HEARING LOSS

Diseases of the ear are treated by physicians, usually Ear, Nose and Throat doctors (Otolaryngologists). Audiologists are health professionals who evaluate hearing and provide non-medical treatment for hearing loss, including hearing aids, assistive listening devices, and auditory rehabilitation.

Some conditions that cause hearing loss, such as otitis media and Meniere's disease. Others can be treated with medication. Others, such as otosclerosis, can be corrected with surgery. Most conductive hearing losses can be treated with medication or surgery. Most sensorineural hearing losses cannot be treated medically or surgically.

Many hearing losses that cannot be corrected medically or surgically can be helped with amplification devices such as *hearing aids* and *assistive listening devices* (ALDs). When a person cannot hear a significant portion of the speech area, hearing aids can help. Most people with hearing loss in both ears do better with binaural hearing aids (both ears) than with a monaural hearing aid (one ear).

There are many different types of hearing aids with many choices of features ranging from simple amplifiers to sophisticated sound processing systems. Like eyeglasses, hearing aids have to be fitted to the individual needs of the user.

There are many assistive listening devices (ALDs) that can help people with hearing loss. These include special FM receivers, visual alerting devices for the home, television-listening devices, and others.

Some people with profound hearing losses can benefit from a cochlear implant, a surgically implanted device that is placed in the inner ear to stimulate the auditory nerve. Many people with cochlear implants are able to understand speech even though they were unable to benefit from hearing aids.

STYLES OF HEARING AIDS

Behind-the-ear (BTE) hearing aids sit over the ear and are coupled to the ear canal by a tube and earmold. The earmold is custom made for each individual. Because the behind-the-ear hearing aid is larger than the others, it can be more powerful and have more features.

In-the Ear (ITE) hearing aids are built into a custom mold of the user's ear.

In-the-Canal (ITC) hearing aids fit into the entrance of the ear canal. Because they are smaller than ITE and BTE hearing aids they are less powerful and can accommodate fewer features.

Completely-in-the-Canal (CIC) hearing aids sit deep in the ear canal. CIC hearing aids are not appropriate for people with small ear canals or with severe hearing losses.

Receiver-in-the-Canal (RIC) hearing aids are BTEs with the receiver (loudspeaker) in the ear canal. Placing the receiver in the ear canal reduces the size of the behind-the-ear device and, for some users, improves the sound quality. Sometimes RIC hearing aids use an Open Fit to provide a more natural sound and avoid the plugged feeling that sometimes is caused by hearing aids.