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## **WHAT IS A COCHLEAR IMPLANT?**

A cochlear implant is an electronic prosthetic device designed to improve hearing for infants, children and adults with severe and profound hearing loss who do not receive sufficient benefit from hearing aids. Cochlear implants attempt to restore hearing by providing electrical stimulation directly to the auditory nerve, and bypassing the damaged sensory cells in the cochlear. The internal component is surgically implanted. An external portion is required for fitting and programming, and may be in the form of a behind-the-ear or a body worn device.

Cochlear implants differ from hearing aids in two ways. Hearing aids make sounds louder and utilize the responsiveness of the sensory cells in the cochlear to send the auditory message to the brain. When patients have severe to profound hearing loss, the sensory cells are damaged and are not capable of responding accurately to speech and other sounds. A cochlear implant, bypasses the damaged sensory cells in the cochlear, and converts acoustic information into electrical stimulation that sends sound to the brain.

## **WHO IS A CANDIDATE FOR A COCHLEAR IMPLANT?**

Infants 12 months and older, children, and adults with severe and profound hearing loss who do not receive sufficient benefit from hearing aids will be candidates for cochlear implants. In many centers, children younger than 12 months may be considered candidates. The determination about implant candidacy is made by the team at the cochlear implant center after medical evaluation, audiological evaluation, hearing aid evaluation, and MRI or CT scan. Children will also frequently have evaluations by a speech-language pathologist, and meet with an educator to assist in evaluating school placement.

## **HOW DOES A COCHLEAR IMPLANT WORK?**

Sound waves enter the microphone located on the headpiece of the external portion of the cochlear implant. The sound is then sent from the microphone, through a cable, to the speech processor. The speech processor is programmed by the audiologist for each individual patient. It converts the sound into a digital signal determined by the program in the speech processor. The signal is then sent back through the cable, through the headpiece, across the skin to the electrodes in the internal portion of the implant. The electrodes stimulate the nerve fibers in the cochlear and send the signal to the brain for interpretation.

## **WHAT IS A COCHLEAR IMPLANT “MAP” OR PROGRAM?**

A MAP or program is a set of “directions” telling the speech processor how to interpret sound. Depending on the particular speech processor, there may be 2 to 4 different programs available. The programs may differ by different degrees of loudness, or MAPs may be designed for different reasons. Some MAPs may be designed for listening to music, for noise situations, or may use different speech coding strategies.

## **DAILY LISTENING CHECKS**

It is critical to check the cochlear implant system daily. Adults can check the system themselves by repeating speech sounds when they turn the system on to be sure that they are continuing to hear sounds well. Children may not be able to do their own checks. Parents and teachers can check children’s systems by having the child repeat sounds or point to pictures. Low, mid, and high frequency sounds should be used to be certain that the child or adult, is hearing well throughout the frequency range, critical for speech perception. The Ling sounds are excellent to use and include *AH, OOO, EEE, SH, SSS, and MMM*.

## **HOW DO WE KNOW IF A COCHLEAR IMPLANT IS WORKING WELL?**

Both children and adults should have cochlear implant evaluations on a regular basis. This should include obtaining thresholds with the implant to be sure that the implant is providing speech information at soft enough levels throughout the frequency range (250-8000 Hz) and speech perception testing at normal and soft conversational levels in quiet and in competing noise. Testing for adults is usually performed annually and for children semi-annually. Whenever concern develops about hearing with a cochlear implant, it is helpful to perform an evaluation.