Introduction to Audiology
Audiolab Assignment: Hearing Aid Clinic

Student Assignment: Hearing Aid Clinic
Background
An important part of audiological (re)habilitation is pairing patients with devices that will amplify sounds to ensure they are audible. The most common devices used are hearing aids, which are considered medical devices and regulated in the United States by the Food and Drug Administration (FDA). Historically, patients required medical clearance prior to fitting hearing aids to ensure no underlying medical conditions existed. Since the late 1970s, audiologists and hearing-instrument specialists have been the only professionals licensed to fit hearing aids. However, starting in December 2016, the FDA no longer requires adult patients to obtain medical clearance for hearing aids. In August of 2022, the FDA allowed a new category of hearing aids to enter the market that can be purchased over-the-counter (OTC). OTCs first became available in October 2022. The purpose of the changes is to improve access to and potentially lower the cost of hearing aids. OTCs are only appropriate for adults ages 18 and older and for those with (perceived) mild-to-moderate hearing loss.

Hearing Aids: A hearing aid has three main components. The **microphone** picks up the acoustic signal and acts as a transducer by converting the acoustic signal into an electrical signal. Then the **amplifier** takes the electrical signal and amplifies it. This amplified electrical signal is converted back into an acoustic signal through the **receiver**. Finally, the amplified sound travels from the receiver into the patient's ear.

Hearing aids include the traditional behind-the-ear model as well as many additional types that cater to users. Examples include body hearing aids (no longer commonly fitted in the United States), eyeglass hearing aids (making a comeback with trendy wearable devices), receiver-in-the-ear hearing aids, in-the-ear hearing aids, completely in-the-ear hearing aids, bone conduction hearing aids, and implantable hearing aids.

Cochlear Implants: While hearing aids can provide many patients with appreciable benefits, some hearing losses are so severe that even the most powerful hearing aids don't provide much benefit. In these cases, a cochlear implant may help the patient gain access to sound.

A cochlear implant (CI) is a surgically implanted device that electrically stimulates the auditory nerve and gives patients with hearing impairment access to sound. Unlike a hearing aid that only amplifies an acoustic signal, a cochlear implant sends the auditory message through electrical impulses directly to the auditory nerve and to the brain. A CI has four main components: an externally worn microphone that picks up the acoustic signal, the sound processor that converts the acoustic signal into an electrical signal, the coil that transfers this information to the receiver implanted under the skin, which sends an electrical signal through the electrode array into the cochlea. These electric currents activate the nerve, which then sends a signal to the brain, which learns to recognize the signal.

Assignment: Hearing Aid Clinic

For this assignment, log into Audiolab, navigate to the Pure-Tone Audiometry - Basic module, and select the Hearing Aid Clinic. Once you enter the clinic, if needed, tour Audiolab to familiarize yourself with the program. When you finish the tour, start your patient care.

For this assignment, continue to practice obtaining audiometric air- and bone-conduction thresholds using the standard down-10, up-5 approach. You must obtain between two and three ascending positive responses to record each threshold. Plot both types of thresholds (air and bone) on an audiogram. Read all case histories closely. Think critically about what other questions you might want to ask your client. Is there any other information you would like to obtain? What do you want to discuss with your client when you are done testing? Be prepared to discuss your case with the class.

This assignment should help you:

- Practice the techniques used to conduct pure-tone audiometry.
- Manipulate different symbols on an audiogram (the graph used to plot audiometric threshold).
- Practice identifying the type of hearing impairment.
- Practice describing the configuration of hearing impairment.
- Think about different intervention approaches for different severities of hearing impairment.
- Assemble information to present to your patient about their test results.

Instructions: Click in the field to manually enter information. To preserve your input, save the document locally.

Part One: Knowledge Check

1. Gain refers to the amount of amplification a hearing aid produces. If a hearing aid receives a 25 dB SPL input and produces an output of 60 dB SPL, how much gain does the hearing aid deliver?

2. What are the differences between a hearing aid and a cochlear implant?

3. A patient asks, “If I get hearing aids, will they restore my hearing?” How would you respond?

4. Historically, it was believed that even though a patient experienced bilateral hearing loss, a unilateral hearing aid was sufficient audiological management. Why is this incorrect?

5. You have a patient with severe to profound hearing loss who reports no benefit from their hearing aids. What might you recommend to this patient and why?

Part Two: Active Learning - Describing Type and Configuration of Hearing Impairment

Log into Audiolab, navigate to the Pure-Tone Audiometry - Basic module, and select the Hearing Aid clinic. Read the instructions to help you better understand the clinic in which you are working. You will be introduced to one of five potential patients. Read the patient's case history, then write notes about your patient. What information about your patient might be important? Are there additional questions you would like to ask?

Before you start testing, think about these questions: Which frequencies will you include in your test? Which ear will you start testing first? How many ascending responses will you require to determine the threshold for each frequency? Will you test both air- and bone-conduction thresholds? How may your instructions vary depending on the patient's age? How long will you present your stimulus for? How long will you wait before you present the next stimulus?

Next, practice instructing your patient out loud that they will be listening for many different tones. The tones will have different pitches and some of the tones will sound very quiet. Explain they should try to sit still, listen attentively, and press the response button when they hear the tone. If they are unsure whether they heard the tone, tell them it is okay to guess.

Report thresholds for the right and left ear using the audiogram in Audiolab. Don't forget to test bone conduction. Once you enter the audiometric data, select "Continue to Review." Review the patient's audiogram and interpret the results. You will be prompted to answer the following question: **Which of the following best characterizes the patient's hearing?** Select your response and enter a summary of your findings.

If you are completing this assignment in class, stop after you complete testing for your first patient. Be ready to talk about your patient's hearing status with the class.

If you are completing this assignment at home, test all five patients. In a separate document, write a brief report indicating your test results and recommendations for each patient (one page limit in total). If the patient does not have normal hearing, describe the severity, configuration and type of hearing impairment. Provide the report to your instructor.

Submitting Your Work

After completion, submit this completed assignment and a copy of your Audiolab transcript(s) to your instructor. If you completed the assignment at home, you will also submit your reports to your instructor.

Citation

Calandruccio, L., & Ligon, E. (2024). Audiolab lesson plan: Hearing aid clinic (Student). [PDF]. Simucase LLC.

References

Gelfand, S. A. & Calandruccio, L. (2023). *Essentials of Audiology,* 5th edition. New York, NY: Thieme.