A Hearing Aid Fitting Protocol

Take the Time, Do It Right

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While speaking to a physician recently, I complimented her on her thorough approach to clinical care. She said that spending five or 10 extra minutes with a new patient helps her know him or her better, saving time in the long run.

This philosophy is relevant to hearing aid fitting and illustrates the value of thorough assessment, verification, counseling and follow-up care. As competition increases and patients continue to investigate hearing aids online, it is more important than ever for us to offer comprehensive care and a solid rationale for our recommendations and decisions. A detailed, consistent protocol, with a foundation in evidence-based practice, will guide sound clinical decisions and instill confidence in patients (Kochkin, 2010). In practices with several clinicians, a set protocol also ensures consistency of care and streamlines the process for everyone.

The American Academy of Audiology has published guidelines for the treatment of hearing loss with hearing aids; the adult guidelines were published in 2006 and the more recent guidelines for pediatric cases in 2013. Both of these publications can be found at Audiology.org.

An unavoidable fact is that proper selection and fitting of hearing instruments takes time. Most of us have full schedules, tempting us to cut corners and trim appointment times. But we are ethically bound to offer the services that meet the patients' best interests. Abbreviating patient history and needs assessment and reducing time allotted for counseling, training or verification measures may allow for more appointments each day, but it also reduces the likelihood of patient satisfaction and increases the number of follow-up visits, as well as the risk of return (Kochkin, 2011).

A COMPREHENSIVE PROTOCOL FOR HEARING AID FITTING HAS FIVE MAIN ELEMENTS:

1. Patient history and needs assessment
2. Diagnostic audiometry and pre-fitting speech tests
3. Fitting and verification
4. Counseling and training
5. Follow-up care and outcome measures

1. PATIENT HISTORY AND NEEDS ASSESSMENT

A successful hearing aid fitting begins at the initial consultation with an in-depth patient history and needs assessment. This should include a discussion of communication difficulties and concerns, activities and lifestyle, visual deficits or dexterity problems, family history of hearing loss, tinnitus, vertigo and associated medical issues, such as diabetes, allergies or chronic sinus infections that could affect hearing. This discussion not only guides the rehabilitation plan, but also allows the clinician to identify other potential problems that could require referral to a physician or another clinical professional.

The technique and depth of inquiry involved in a patient history and needs assessment may vary significantly from one clinician to another. I find it helpful to have a detailed patient history form containing all the pertinent questions that should be asked of a new patient. This not only guarantees that all the clinicians in the practice are asking the same questions, but also makes the process easier and more efficient. Similarly, for a hearing handicap and needs assessment, indices like the Hearing Handicap Inventory for Adults (HHIA), Hearing Handicap Inventory for the Elderly (HHIE), the Abbreviated Profile of Hearing Aid Benefit (APHAB) or Client Oriented Scale of Improvement (COSI) offer a structured approach to ensure that important issues are consistently addressed (Ventry & Weinstein, 1982; Cox & Alexander, 1995; Dillon, Birtles & Lovegrove, 1999). The APHAB and COSI are designed to first assess needs and concerns and then to determine how much benefit has been afforded by the new hearing aids by evaluating how the concerns have changed after fitting.

The COSI can be downloaded here: http://www.nal.gov.au/outcome-measures_tab_cosi.shtml

The APHAB can be downloaded here: http://harlmemphis.org/index.php/clinical-applications/aphab/

Some clinics post needs assessment surveys on their website or include them with intake forms, so patients can complete them prior to the appointment. The HHIE-S (screening version), a brief 10-item questionnaire, is well suited for use as a preappointment assessment tool. The HHIE and HHIA have also been modified for completion by a spouse or significant other. This can be useful since a spouse, friends or family members often have a more acute awareness of hearing difficulties than the person with the hearing loss. The APHAB "Without Hearing Aid" column can be filled out ahead of time so the responses can be discussed during the appointment. The COSI is best completed in person with the patient, especially the initial portion in which the patient identifies listening situations that are difficult and/or important and indicates why these situations are problematic. The APHAB and COSI are available within the Noah 4 software, which makes them readily available and easy to administer and score.

The Speech, Spatial and Qualities of Hearing Scale (SSQ), in its original form, is a good tool to assess how hearing loss affects a person's ability to function in some everyday listening environments, probing for detail about what makes the situations difficult (Gatehouse & Noble, 2004). For instance, rather than just asking patients if they struggle to hear in restaurants, the SSQ asks questions that differentiate hearing in groups from hearing in groups in noise and then in groups in noise without visual cues. It is particularly useful for patients who do not usually offer a lot of detail about their communication difficulties. The SSQ addresses speech understanding, localization, identification of environmental sounds and the ability to separate and identify two simultaneous sounds or voices, and respondents rate their abilities on a 10-point scale.

2. DIAGNOSTIC AUDIOMETRY AND PREFITTING SPEECH TESTS

After the history and needs assessment, the next step is diagnostic testing. Pure tone audiometry and word recognition testing are standard procedures that clinicians have performed many times, but the importance of accuracy at this point in the process can't be overstated. Hearing aid prescriptive formulae rely on accurate thresholds, so a fitting is bound for failure if the audiogram has inconsistencies or errors. Clinicians are accustomed to being on the lookout for collapsing ear canals, and insert earphones are the transducer of choice for most clinicians. However, it is occasionally advisable to retest with supra-aural headphones to confirm findings. The converse is true if supra-aural phones are usually used; it is necessary to have insert phones available, especially for patients who have small, narrow or sharply curving ear canals, or soft cartilage.

When air-bone gaps are obtained and the patient has normal tympanometry and no history of middle ear pathology, transducer error should be suspected. Sometimes the only unusual result is a poor word recognition score. If word recognition scores are unexpectedly low given a patient's reported concerns and his or her apparent ease of communication, he or she should be retested at a few presentation levels and also retested with another type of transducer.

Individuals who have precipitously sloping hearing losses should also be tested for word recognition ability at several levels to obtain a PB max score. It can be challenging to obtain valid word recognition information with precipitous losses, and testing at one level might not adequately portray their ability to understand speech in quiet conditions. An accurate assessment of word recognition ability is important for diagnostic reasons, as well as for selecting hearing aid options and setting appropriate expectations for real-world performance. These suggestions might seem didactic, but because of issues like these, I have frequently had to repeat audiometry for patients who brought their tests from another clinic.

Loudness comfort should always be evaluated prior to hearing aid fitting, either by obtaining most comfortable listening levels (MCLs) and loudness discomfort levels (LDLs) or conducting loudness scaling. Many clinicians do not test MCLs and LDLs, despite the fact that a patient's loudness tolerance directly impacts the selection of hearing aid gain and MPO. LDL values can be entered into the software so they are incorporated into the prescriptive targets. Mueller (2003) warns that there is a great deal of variability among the MPOs that manufacturers prescribe for the same LDL, so it is necessary to verify comfort at the fitting. Frequency-specific LDLs should be obtained using pure tones, with ascending trials in frequency ranges where there will be amplification. Mueller suggests that to save time, it is not necessary to obtain LDLs in regions where the patient has normal hearing. The Cox Contour Test is a valid measure for determining unaided or aided loudness comfort levels and is quick and easy to administer (Cox, Alexander, Taylor & Gray, 1997).

Most clinicians proceed to hearing aid selection at this point, but because so many people with hearing loss report difficulty understanding speech in noise, it makes sense to add an additional step to the protocol. Speech-in-noise testing prior to the hearing aid fitting can identify patients who are likely to struggle in crowded, everyday environments. The most popular of these tests is the QuickSIN, a simple procedure with clear guidelines that does not require specialized equipment (Killion et al., 2004). The QuickSIN is a sentence-based test that measures signal-to-noise ratio (SNR) loss or the additional SNR improvement required by a hearing impaired individual to perform as well as someone with normal hearing. Poor performance on the QuickSIN supports the recommendation of directional microphones and perhaps FM, remote microphone or wireless

accessories to improve SNR in everyday situations. Individuals with elevated SNR loss scores should also be counseled about the proper use of their hearing aid programs, positioning in noise, communication strategies and reasonable expectations for amplification use.

Another speech-in-noise test that provides useful information at the pre-fitting stage is the Acceptable Noise Level (ANL) test (Nabelek et al., 2006). The ANL tests for the highest acceptable level of background noise in which the patient can still understand speech at his or her most comfortable level (MCL). The ANL score is determined by subtracting the background noise level from the MCL, so individuals with higher ANL scores are less able to tolerate noise when listening to speech. As with patients who have poor QuickSIN scores, these people may need additional counseling about listening strategies and may be more likely to benefit from directional microphones and manually accessible noise programs with reduced overall gain, low-frequency gain, increased directivity and noise reduction. In addition to guiding hearing aid recommendations, high ANL scores may predict which patients are less likely to be successful or full-time, long-term hearing aid users (Plyler, 2009).

The diagnostic, loudness and speech-in-noise test results provide essential information for hearing aid selection. Again, this is a process familiar to dispensing clinicians, but it bears repeating that there are several factors that should be considered in order to arrive at the correct recommendation. The audiogram certainly helps guide the selection of hearing aid style, but additional considerations like manual dexterity, visual acuity, ear canal and pinna anatomy should also factor into the decision. For example, receiver-in-canals (RICs) are discreet, comfortable and an excellent choice to reduce occlusion, but they can be more difficult to manipulate and insert than custom canal or full-shell styles. Patients with chronic otitis externa, or with middle ear pathology accompanied by a perforation of the tympanic membrane and chronic drainage should avoid custom or RIC instruments and should always have generous air vents in their earmolds. Visually impaired hearing aid users or those with cognitive challenges may do better with rechargeable instruments that do not require weekly battery changes. Failure to consider how these factors influence the hearing aid selection can result in frustration and disappointment early in the fitting process, possibly resulting in a return for credit.

After the hearing aid style has been selected, features should be discussed with reference to lifestyle, occupation, activities and listening needs. Generally, individuals with jobs that take place in crowded or reverberant environments can benefit from more sophisticated circuitry, whereas someone with a quiet lifestyle may still be able to do well with a model with fewer features. Wireless accessories should be presented with reference to individual needs and difficulties with phone use, television viewing and/or communication in noise. Even if wireless devices are not desired at the time of the selection, determining the potential for future need ensures that compatible hearing aids are selected. As many churches, theaters and auditoriums install loop systems, telecoils are regaining popularity. Finding out if the church has a loop system or asking if the patient attends plays and concerts helps determine a new hearing aid user's need for a telecoil.

3. FITTING AND VERIFICATION

In the early 1990s, the Independent Hearing Aid Fitting Forum (IHAFF) specified three minimum goals that must be achieved by a hearing aid fitting: to make soft sounds audible, moderate sounds comfortable and to ensure that loud sounds are not uncomfortable (Valente & Van Vliet, 1997). Though entering experience level and acoustic parameters like tube type, venting, and earmold or dome type into the fitting software probably results in more accurate predicted match to targets, it is not adequate to simply apply the first fit without performing objective verification.

Still, many clinicians use the first fit option in the manufacturer's software, programming the devices for a first-time or inexperienced user. This is common practice, despite several studies that indicate first fit levels may result in inadequate audibility. Killion, Spankovich and Schau (2004) performed probe microphone measurements on seven hearing aids programmed with proprietary first fit settings and found that the resulting aided audiograms still resembled unaided tests of typical hearing aid candidates. When Articulation Index (AI) scores were calculated on these aided audiograms with the count-the-dots method, more than half of the speech cues were still missing (Mueller & Killion, 1990). To paraphrase Pascoe (1980), providing audibility does not ensure that the individual will understand speech clearly, but inaudible speech is obviously much less likely to be understood!

Despite numerous studies supporting the value of probe microphone measurements, fewer than 50 percent of clinicians report doing them regularly (Mueller & Picou, 2010). One of the most compelling studies to illustrate why this is a concern was reported by Aazh and Moore (2007), who programmed hearing aids from four manufacturers using first-fit algorithms. Subsequent probe microphone measures showed that only about 36 percent of the fittings were within +/- 10dB of prescribed NAL-NL1 targets. This clearly indicates that clinicians who rely on the first fit may be underfitting their patients, limiting audibility and therefore limiting hearing aid benefit.

Manufacturer's first fit algorithms provide a starting point, but to ensure adequate audibility, gain and output should be verified with probe microphone measures and validated targets like NAL-NL2 or DSLv5. Underfitting is probably more likely to occur, but providing too much gain or output must also be avoided. Probe microphone measurement of MPO can ensure that the sound pressure level at the eardrum is not going to exceed the measured LDLs, and frequency-specific, aided LDL testing in sound field can provide a quick determination of comfort.

Though speech-in-noise testing is typically used as a pre-fitting measure, it can also be used to verify performance at or after the fitting. The QuickSIN, for example, can be used in the sound field to verify directional microphone performance and to demonstrate the benefit of directionality to the patient. The BKB-SIN sentence test is also used for this purpose, but the QuickSIN is commonly used and provides specific guidelines for use in the sound field (Bench, Kowal & Bamford, 1979).

4. COUNSELING AND TRAINING

Before going home with new hearing aids, patients need training and guidance in use and maintenance. As most clinicians know, any problem that affects sound quality, be it a clogged wax trap, blocked tubing or a waterlogged filter in an earhook, will be experienced by patients as a failure of the hearing aid, causing them to question the quality of the instrument and the value of their purchase. Training new users to change wax traps and domes, clean their hearing aids regularly, and come in for regular tubing changes and checkups mitigates problems and helps avoid disappointing performance failures. Providing cleaning wipes or spray, cleaning tools and extra wax traps and domes equips patients with the supplies they need to keep their aids in proper working condition. Active or passive hearing aid dryers are beneficial, especially for people who work or spend leisure time outdoors, as they can prevent moisture-related problems. Reminders for regular tubing changes and checkups can help prevent split tubing and preempt last-minute emergency appointment requests.

Verification measures determine that sufficient audibility has been provided, but counseling is still important for new hearing aid users to set realistic expectations and prepare them for the adjustment process. Clinical verification techniques, though essential, do not replicate real-world environments, and new hearing aid users must be advised to report discomfort or difficulties so that appropriate adjustments can be made. I like to ask my patients to journal their experiences

in the first few weeks of use. This serves several purposes: it promotes consistent daily use, provides a structured basis for addressing issues at follow-up visits, and can illustrate their progress when they realize that sounds they found irritating on day one or two are no longer bothersome by day 13 or 14.

Though the effect of acclimatization on the perception of speech and complex sounds is subject to debate, it is well known that new hearing aid users initially prefer reduced gain and take some time to become accustomed to amplified sound (Keidser et al., 2008). It helps to discuss this at the fitting and to provide examples of sounds — such as crinkling paper, water running, loading a dishwasher — that will be surprising or mildly annoying in the initial stages of hearing aid use, and to assure the patients that these sounds will become progressively less irritating as they continue with consistent, daily hearing aid use. Household and workplace sounds will command more attention in the early days of hearing aid use, but the patients will adapt to the new sounds and will soon be able to ignore unimportant environmental sounds and pay attention only to relevant sounds, as people with normal hearing do.

5. FOLLOW-UP CARE AND OUTCOME MEASURES

Follow-up care after a hearing aid fitting is an essential, arguably the most important, part of the process. It is critical to establish that the hearing instruments are addressing the concerns outlined in the initial needs assessment. Even with verified, properly fitted hearing aids, the real measure of success is whether the new user is functioning well at work, in restaurants, in social gatherings, at church and in other everyday situations. Outcome measures offer a structured way to ensure that problems are addressed and to measure benefit and satisfaction. Post-fitting care may also involve additional counseling, device orientation or auditory training, depending on the progress and experiences of the individual.

At our clinic, we schedule mandatory two-week checkups after all hearing aid fittings and encourage patients to wear their aids consistently and to test out a variety of listening environments in the interim. This appointment is usually well timed with their initial adjustment to amplified sound. Within two weeks, most new hearing aid users have become acclimated to the sound of their own voices, and the environmental sounds that were annoying in the early days are no longer noticeably different or irritating. Those sounds or situations that remain problematic should be addressed with programming modifications. The two-week checkup is a good time to complete the "Degree of Change" section of the COSI, in which the patient judges changes in the situations that they nominated at the initial consultation. The "With Hearing Aid" section of the APHAB can also be filled out, provided the patient has been wearing the aids consistently and feels ready to respond in adequate detail to the questions (Cox, 1997). Patients who require significant programming modifications, earmold changes or whose use was limited by discomfort during the first two weeks should postpone the COSI and APHAB until a subsequent visit.

The two-week checkup is also a good time to review use and care instructions and to field any questions the patient has about hearing aid maintenance. A great deal of information is covered at the fitting appointment, which is usually a lengthy visit, and I find that many people need a reminder about the techniques for cleaning the aids or changing wax traps and domes. Sometimes it is advisable to postpone discussion of wireless accessories or other items like hearing aid dehumidifiers and specialty cleaning supplies until the two-week checkup, after the patient has had a chance to become accustomed to the aids and to absorb the basic guidelines for use.

The Hearing Aid Users Questionnaire (HAUQ) is a helpful tool to use at this time, as it specifically probes for issues with the hearing aids that could limit use or negatively affect satisfaction (Dillon,

Birtles & Lovegrove, 1999). For example, it addresses problems with hearing aid comfort, manipulation of controls, insertion, removal, and occlusion. It is usually better to administer the HAUQ early in the process, either at or shortly after the two-week checkup, so that problems can be addressed well within the trial period. The HAUQ is designed to be administered either by phone or by mail, so it does not require an appointment.

Patients who have discomfort or difficulty with the aids or require detailed programming modifications should schedule another visit after a week or so to determine that their problems have been addressed. Individuals who are doing well at the two-week checkup should return in two to three months. By this time, most people have adjusted enough that they are ready to progress to the full prescriptive targets of their hearing instruments. I personally prefer not to use automatic acclimatization, as I find that every person is different, and I like to discuss their experiences to determine whether changes are necessary or appropriate. Most hearing aid users will notice when they are ready for more gain, usually after a few months of use. If gain and output levels were verified and adequate at the fitting, then the final target levels can simply be selected in the software and verified with additional probe microphone measures. If not, probe microphone measures may be useful to guide increases in gain to final levels. Increases in gain over initial levels should be avoided, of course, for those who experience loudness discomfort or concerns about increasing the gain.

After a few months of consistent hearing aid use, the COSI "Final Ability" section and the APHAB "With Hearing Aid" section can be completed if not already administered at a previous visit. The SSQ-B (Benefit version) is a version of the SSQ that asks respondents to compare how well they functioned before and after the hearing aids to determine the degree of change in performance under specific conditions. The situations presented in the SSQ-B are the same as the ones in the original version, so situations of particular concern can be examined with reference to improvement with amplification.

At this point, it is also timely to offer a satisfaction survey. Though the COSI and APHAB are excellent measures of benefit, it is clear that benefit and satisfaction, though related, are not the same (Killion, 2004; Kochkin, 2003). There are a number of ways to assess satisfaction. Some clinicians prefer to write their own surveys or call patients with specific questions. In the interest of providing a consistent standard of care, it makes sense to use standardized tools that have norms and have undergone validation. The Satisfaction with Amplification in Daily Life (SADL) scale focuses on patient satisfaction, inquiring about positive effects of the hearing aids, services and costs, negative features and how the hearing aids affect the user's personal image (e.g., whether the aids make him or her feel more or less self-confident or capable) (Cox & Alexander, 1999; 2001). The Glasgow Hearing Aid Benefit Profile (GHABP) measures hearing disability, handicap, hearing aid usage, benefit and satisfaction (Gatehouse, 1999). It includes four set questions, and then the patient nominates four situations in which it is important for him or her to hear well and responds to both on a five-point scale. In this way it is similar to the COSI, but the GHABP goes further to evaluate specific reactions to the nominated situations. The International Outcome Inventory for Hearing Aids (IOI-HA) primarily measures hearing aid benefit and quality of life changes with hearing aid use but does directly address satisfaction in one question (Cox et al., 2003). The IOI-HA is brief and simple, so it works well as a mail-in questionnaire.

The SADL can be downloaded here: http://harlmemphis.org//index.php?cID=131

Patients who continue to have difficulty communicating in noise after receiving their hearing aids may benefit from additional aural rehabilitation and auditory training. This can include training in beneficial communication strategies like speech reading and asking conversational partners to slow their rate of

speech, repeat or rephrase. Conversely, some patients may need training to reverse acquired maladaptive strategies, like relying on another person to keep them involved in a conversation, pretending to hear or withdrawing from conversation. Auditory training sessions can potentially strengthen a listener's ability to assimilate environmental, acoustic and linguistic speech cues and teach them to use adaptive strategies to function better in difficult listening conditions.

Listening and Communication Enhancement (LACE) is a computer-based program that addresses speed of processing, auditory memory, communication strategies and processing speech in degraded conditions. It can be done with the clinician in a guided session, but is well suited for home use via a web-based program on a PC or with a DVD that allows interactive sessions on the television. Though not widely used by clinicians, auditory training methods like LACE can help patients learn better listening strategies and may even improve their ability to recognize speech in noise (Sweetow & Palmer, 2005).

Hearing impaired individuals are not all alike, and no one approach will work for everyone. Some patients require little counseling and training; others require multiple sessions. Some function well in difficult environments with properly fitted hearing aids, and others still struggle, requiring additional therapeutic intervention. A structured clinical protocol for hearing aid fitting, with a foundation in evidence-based practices, provides a template for assessing and addressing the needs of hearing aid patients, helping clinicians make the most appropriate decisions at every step of the process. Taking the time to implement a comprehensive fitting protocol ensures a consistently high standard of care, increases the likelihood of success and satisfaction with new hearing aids and saves time for the clinician in the long run. As famed UCLA basketball coach John Wooden said, "If you don't have time to do it right, when will you have time to do it over?"

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