

**ASPECTS OF THE HEARING CONSERVATION  
REHABILITATION PROGRAM**

**PENNSYLVANIA OFFICE OF VOCATIONAL REHABILITATION**

(The Office of Vocational Rehabilitation is a part of the Pennsylvania  
Department of Labor and Industry.)

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## **FORWARD**

This resource was developed to assist Rehabilitation Counselors, Audiologists and others who serve people who are deaf and hard of hearing to maximize employment, independence, and integration into society. This document is intended to serve as a guide and is not to be considered Office of Vocational Rehabilitation's (OVR) or Department of Health official policy.

The PA OVR has resource people who can be contacted for advice and consultation regarding clients who are deaf and hard of hearing:

Dr. Bruce M. Siegenthaler  
OVR Hearing and Speech Consultant  
Room 5B, Moore Building  
University Park, PA 16802  
(814) 865-0331  
(814) 237-4023

Sandy C. Duncan  
Rehabilitation Specialist  
1313 Labor and Industry Building  
Harrisburg, PA 17120  
(717) 772-1659 – Voice  
(717) 787-4885 – TTY  
1-800-442-6351 – Voice (PA only)  
1-800-233-3008 – TTY (PA only)

# Part I

## Overview

*I. OVERVIEW OF THE PENNSYLVANIA OFFICE OF VOCATIONAL REHABILITATION (OVR) HEARING CONSERVATION PROGRAM*

The PA OVR is jointly funded by the United States Government and by the state of Pennsylvania. It is similar in many ways to programs in other states although they may have names such as Bureau of Rehabilitation.

The primary function of the OVR is to make each disabled individual able to function in gainful competitive employment at his or her maximum potential in an occupation that is suitable to the individual. For the hearing impaired Client this involves services which may include, but are not limited to, initial evaluation, specialty examinations (such as psychological, otological, audiological, medical and vocational aptitude and interest), counseling, prosthetic devices, training in the chosen occupation, and follow-up after job replacement. If a Client's conditions changes significantly, the case may be reopened for further rehabilitative efforts.

There are no mandatory age limits in the OVR program. Theoretically, a person could be served from infancy throughout his or her life. However, a requirement before OVR-sponsored rehabilitation can be undertaken is that a realistic vocational goal must be identified. In practice, few Clients are enrolled in the program before sixteen years of age. By this time the vocational interest and adult levels of proficiency often can be identified. Prevocational evaluation and counseling may be done if a vocational goal is not readily determined.

There is no upper age limit for a Client, but there must be reasonable expectation for a productive life of gainful employment.

In the OVR program the Counselor is the key individual. He or she does initial evaluations of the Client, arranges follow-up examinations, collates the obtained information, counsels the Client regarding vocational choice, arranges rehabilitative measures which may include training and monitors the Client until case closure. Development of a rehabilitation plan is done cooperatively between Client and Counselor.

In each District Office (DO) of OVR, in addition to Counselors, there are Supervisors, the Administrator of the Office, and supporting staff. In PA the District Offices are:

Allentown	1-800-922-9536	(610) 821-6441
Altoona	1-800-442-6343	(814) 946-7240
DuBois	1-800-922-4017	(814) 371-7340
Erie	1-800-541-0721	(814) 871-4551
Harrisburg	1-800-442-6352	(717) 787-7834
Johnstown	1-800-762-4223	(814) 255-6771
New Castle	1-800-442-6379	(724) 656-3070
Philadelphia	1-800-442-6381	(215) 560-1900

Pittsburgh	1-800-442-6371	(412) 392-4950
Reading	1-800-422-0949	(610) 378-4370
Rosemont	1-800-221-1042	(610) 525-1810
Washington	1-800-442-6367	(724) 223-4430
Wilkes-Barre	1-800-634-2060	(570) 826-2011
Williamsport	1800-442-6359	(570) 327-3600
York	1-800-762-6306	(717) 771-1319

Other staff are Rehabilitation Specialist in the Harrisburg Central Office and Consultants. Questions which arise may be referred to the District Offices or the program staff.

Following is the usual sequence for serving a hearing impaired Client of the OVR:

The Client is referred to OVR District Office. This may be done by anyone including the Client, family member, Audiologist, Physician, Employer, School Personnel, Counselor, Hearing Aid Dispenser-Fitter.

The District Office assigns a Counselor.

An initial interview with the Client is arranged. The Counselor gathers basic information about the Client's perceived problem, financial status, general area of interest, employment, educational history, and medical history.

Financial eligibility is determined. OVR has a variable scale of financial support depending upon such things as Client's income and other resources, family size, and financial matters which may pertain to eligibility. This is done according to a pre-determined agency standard formula.

Counselor gathers available medical information or arranges appropriate examinations and consultations. These may include a general medical examination, special medical examinations (otological for hearing impaired Clients), audiology examination which may include hearing aid consultation, other tests such as psychological or vocational aptitude and interest, request for educational records, etc.

It is determined by the Counselor whether the Client has a disability and is eligible for OVR services. An Individual Written Rehabilitation Plan (IWRP) is prepared by the Counselor and Client and approved by the Client. This may include a hearing aid recommendation.

Implementation of the IWRP. (For some Clients only the diagnostic services are funded or there is some other pattern of cost sharing, depending on financial status.)

Counseling is ongoing with the Client regarding his or her vocational adjustment.

Job placement is facilitated by the Counselor.

After a two-month follow-up, if placement is suitable, case is closed. According to federal regulations, persons with all degrees or disability may be served.

It may be determined that the Client is not eligible for services other than counseling, or the handicap is so severe that there is not potential for gainful employment and the Client is not continued.

The OVR has no limitation regarding sex, religion, national background or race of Clients served. Any legal occupation may be considered for a Client, including homemaker, where there is a significant vocational handicap and where rehabilitative measures will make a significant difference in the Client's vocational life.

In general, any kind of assistance may be considered but it must relate to remediation of the Client's vocational disability and facilitate gainful employment.

Because public funds are involved, the Office tends to be conservative regarding new, novel or unusual rehabilitation measures until they are substantially supported by scientific literature and have demonstrated their rehabilitation effectiveness. Cochlear implants, auditory-to-tactile or light transponders, tinnitus maskers, bone conduction implants, exotic electronic circuits, mechanical hearing devices, and ear canal or deep-placement hearing aids, as of this writing, are in this category.

## *II. HEARING AIDS IN VOCATIONAL REHABILITATION*

Public and private agencies continue a commitment to rehabilitating hearing impaired persons, and a part of the caseload of rehabilitation counselors is persons with hearing problems. This requires appreciation of several factors important to the vocational rehabilitation of hearing impaired Clients.

### Various professions are involved in Hearing Conservation Program

The Otologist is a licensed medical doctor who is Board Certified and who specializes in ear disease and surgery or other medical treatment of hearing disorders. Medical-surgical correction is the desired solution to a person's hearing problem. OVR will provide a hearing aid only after there is medical clearance by a physician, and if a residual hearing problem results in a vocational handicap.

The Audiologist, not be confused with the Hearing Aid Fitter or Dispenser, measures hearing impairment and handicap, does differential diagnostic tests which assist in medical diagnosis, assesses the relationship between hearing loss and social, psychological, or vocational problems, recommends hearing aids or other aural rehabilitation, and does counseling related to hearing problems. Audiologists typically are oriented toward acoustic rehabilitation, tend to make close interpretation of test scores, and are responsive to the Client's personal feelings about being hearing impaired. The Audiologist, who also may be a Dispenser, has at least a master's degree, has passed national examination and must hold a license to practice in Pennsylvania.

The Vocational Rehabilitation Counselor works with the Client to determine vocational goals and vocational disability, and approves procedures to remediate problems related to vocational adjustment. For a hearing impaired Client the benefits from a hearing aid must be important vocationally to justify purchase of an aid by a vocational rehabilitation agency. Counselors are qualified by academic training and Civil Service examinations in Pennsylvania. The Audiologist may recommend a hearing aid, but the Counselor may not follow the recommendation because of a more broad view of vocational adjustment and the constraints of the funding agency policy.

The Hearing Aid Dealer – Fitter (Dispenser) in the OVR program provides the prescribed hearing aid, ear mold and often basic instructions in use of an aid. The Dispenser may, in some cases, determine the brand and model of an aid. Dispensers – Fitters have other functions including hearing aid repairs and honoring hearing aid guarantees. Registration as a Dealer – Fitter is by state examination. Dispensers have more extended functions for non-OVR Clients.

### Hearing Aids for the Deaf Clients

It is important that hearing aids not be prescribed as a matter of course for the deaf. If the person used a hearing aid while in school and continued to wear it even though audiological tests demonstrate relatively little benefit, the presumption should be that an aid is useful and OVR may become involved. Conversely, if the person had a significant school experience with a hearing aid, discarded it after leaving school, and has not worn an aid since, one should question whether a hearing aid is of value or would be used if another were provided.

The congenitally deaf person who has poor speech and language presents special problems. Even if a hearing aid, speech therapy, and auditory training are provided, the age when the foundations of speech and language are learned has passed. The necessary learning experiences now are difficult or impossible to provide and there is a markedly reduced chance that effective oral communication can be developed. If the person has poor manual communication skills, training in sign language may be appropriate. There may be other benefits from an aid, however. These usually can be noted by an audiological evaluation.

A hearing dog may be useful for solving some vocational problems of the deaf, but this has not yet been demonstrated adequately. Often the only benefits to a deaf person with a hearing dog are alerting to warning signals and other environmental sounds. Unfortunately, these too often provide little help for vocational adjustment as mediated by the dog, although they may be of social and life-style significance.

### Hearing Loss, Job Requirements, and Hearing Aids

Hearing impairment may have a major impact on a person's choice of vocation, ability to stay on the job, or level of job performance. For some occupations hearing impairment may not be a significant factor and hearing loss is more related to the person's personal

and social life. Good practice by a Counselor would be to identify the specific hearing functions important to a specific job and to make these known to the Otologist and to the Audiologist. The Counselor should receive audiological evaluations directly related to the hearing requirements of the person's job, the extent of the impairment in hearing function and the results of remediation.

Job-related hearing functions commonly include hearing warning or machinery noise, hearing commands or work instructions, using telecommunications equipment, conference participation, auditory localization, hearing in noise, discriminating among fine differences in sounds, application interviews and participation in pre-vocational evaluation and training.

A significant hearing impairment of both ears causes problems on most jobs and may be remediated by a hearing aid. A hearing impairment in one ear only often does not constitute a significant vocational problem, but this needs to be evaluated carefully for each individual. A hearing aid may be recommended to restore such functions as auditory localization, ability to hear well in noise, or hearing from the bad side.

A common concern is the person with hearing impairment in an occupation for which sensitive hearing is especially important. For example, a teacher of elementary children probably should have good hearing. The school child often is in a speech development phase and the teacher should be able to hear adequately in order to facilitate speech and language development. However, hearing impaired teachers in schools for the deaf are not uncommon. Many people feel that a handicapped teacher is better able to understand the deaf child's problems, although others feel that to develop communication skills in the hearing impaired student the teacher should have speech and language not influenced by deafness. Certain occupations such as speech therapist require good hearing because of the importance of hearing fine differences in a child's speech to bring about correction.

High levels of noise cause hearing damage. Persons with conductive or middle ear problems are less susceptible to high level sounds, but this does not mean that they are especially suited for noisy work conditions. Exposure to high levels of noise on the job results in noise-induced hearing loss which may become vocationally handicapping. Unfortunately, by the time a worker has been on a job long enough to develop a noise-induced hearing loss he or she may be so committed that vocational change is not practical. Therefore, one needs to seek hearing conservation and rehabilitation measures to maintain the present occupation. The danger is that a hearing aid will give increased exposure to job noise and have a further deleterious effect on hearing acuity. The employee should turn off the hearing aid when it is not needed. The presence of the hearing aid ear mold, especially one of the standard type, somewhat reduces sound into the ear as protection against noise. An ear plug worn in the opposite ear while continuing to wear the turned-off hearing aid also is helpful.

Many office workers, receptionists, 911 operators, and secretaries among others need functional hearing by telephone, and use of the telephone may be important for the homemaker who is a young mother with children at home. An audiological evaluation

should include tests of hearing over the telephone with and without hearing aid when the job depends on using a telephone. Telephones with amplifier handsets are available, but an alternate is to use a hearing aid with a telephone (T) switch. This couples the electromagnetic output of the telephone to the electromagnetic input of the hearing aid. Some telephones do not have electromagnetic output and the T switch is not usable unless a special coupler is obtained. Portable telephone couplers and amplifiers can be obtained from a hearing aid Dispenser, telephone company, or electronic store. For hearing impaired individuals who cannot use the telephone, teletypewriter devices may be appropriate.

Auditory localization is important for a number of vocations. Workers need to be aware of the direction of warning signals, truck back-up horns, and vehicles coming from around corners. Localization is impaired in the Client with a unilateral hearing loss; a hearing aid fitted to the bad side may restore localization. CROS hearing aids are appropriate for some. Evidence that a binaural or other hearing aid fitting gives localization is necessary if one is to be recommended for localization purposes.

To be able to hear in the presence of many talkers or in noise is important in many occupations, and a problem for most hearing impaired individuals. A binaural hearing aid fitting may assist. It should be evaluated by the audiologist by testing in noise as well as in quiet, both with and without a hearing aid. However, normal hearing people also have trouble hearing in noise.

Several factors limit the effectiveness of binaural hearing aids. These include ears with unequal characteristics and dependence on exact adjustment of the hearing aids. There should be clear demonstration that the binaural fitting significantly improves the person's auditory ability.

The evidence is that some people who obtain binaural or CROS hearing aid fittings find that the over-all benefits do not justify their continued use and they revert to an aid in one ear only.

#### Audiology Facility Standards

An OVR Client's eligibility for hearing services depends largely on amount of hearing handicap and resulting functional imitations. Inaccurate hearing assessment may result in errors in medical/surgical diagnosis and treatment, in determination of vocational disability, and in rehabilitation procedures. If a person has more hearing loss than believed, he or she may be denied services or be provided with incorrect services such as a hearing aid with not enough gain. If a person has less hearing loss than believed, this may lead to incorrect rehabilitative services (such as a hearing aid having too much gain). OVR is an eligibility not an entitlement program and accurate testing is important.

Monitoring clinic test facilities and requiring that professionals are licensed or registered are ways to assure that people receive quality service. Because OVR receives federal support, federal regulations, guidelines and procedures regarding standards must be honored.

State and federal agencies commonly have internal regulations which approve services only from programs meeting national standards. The American National Standards Institute (ANSI) and the Professional Service Board (PSB) of the American Speech-Language-Hearing Association (ASHA) have standards pertaining to audiology clinical facilities.

The PA OVR uses current ANSI Specifications for Audiometers for audiometer calibration, Reference Equivalent Threshold Force Levels for Audiometer Bone Vibrator for bone conduction calibration, and ANSI Criteria for Permissible Ambient Noise During Audiometric Testing for permissible test room ambient noise. It also draws from the Professional Service Board standards.

### Dispenser Actions and Considerations

The PA Department of Health Hearing and Speech Program relates to the OVR when individuals with vocational handicaps are in their late high school years. Depending upon inter-agency agreements, a Client who is still in school and under the age of twenty-one may be served by the Department of Health or by the PA OVR. The Department of Health has a separate set of regulations and practices, but the intent is for the agencies to work cooperatively. Other agencies such as Welfare and Office for the Blind may be involved in hearing impaired cases to a minor extent.

Contact with these committees can be made through:

Hearing/Speech Program Specialist  
Office of Vocational Rehabilitation  
1313 Labor and Industry Building  
Seventh and Forster Streets  
Harrisburg, PA 17120  
Telephone Numbers: 717-787-4752; 717-783-8917(TTY); 717-783-5221 (FAX);  
1-800-442-6351 (Toll free)

All Dispenser in Pennsylvania must be registered with the PA Department of Health under Act 262. Registration is with the PA Department of Health, Bureau of Community Program Licensure and Certification, 132 Kline Plaza, Suite A, Harrisburg, PA 17104, Telephone number: 717-783-8078.

The OVR hearing aid pricing agreement is state-wide for OVR.

The Dispenser needs to obtain an OVR vendor number with the help of the District Office hearing Program Designee.

To be an OVR vendor, an OVR form is completed and forwarded to the Program Specialist by the Dispenser when the hearing aid Dispenser/Fitter, Audiologist/Dispenser is applying to become a hearing aid supplier (vendor) to OVR, or when the hearing aid Dispenser has opened a new or branch office. Branch offices are treated as new (separate) offices.

The District Office staff places a supplier on the vendor list after it has been established that the Dispenser has the Department of Health registration.

The OVR Central Office does not maintain approved lists for vendors. The approved lists are coordinated by the District Office's Hearing Program Designee (HCD).

Apprentice Fitters who have not yet been registered but are supervised by a registered Fitter are acceptable as Dispensers for a one-year period, as per state law.

*III. PA AGENCIES SERVING PERSONS WITH HEARING IMPAIRMENT (NOT AN INCLUSIVE LIST)*

Office for the Deaf and Hard of Hearing  
Department of Labor and Industry  
909 Green Street  
Harrisburg, PA 17102  
717-783-4912            1-800-233-3008

Regional Representative  
Helen Keller National Center on Deaf Blindness  
2 Chester Pike  
Ridley Park, PA 19078  
215-521-1370 (Voice/TDD)

Bureau of Community Program Licensure and Certification  
PA Department of Health  
132 Kline Plaza, Suite A  
Harrisburg, PA 17104  
717-783-8078  
(Registers hearing aid Dispensers and Fitters)

Bureau of Family Health  
Division of Child and Adult Health Services  
Speech and Hearing Program  
7<sup>th</sup> Floor East Wing  
Harrisburg, PA 17108  
1-800-986-4550  
(Provides speech and hearing services up to age 21)

Department of State  
State Board for Speech-Language and Hearing Examiners  
PO Box 2649  
Harrisburg, PA 17105  
717-783-1389  
(Oversees licensure of audiologist /speech pathologist, and teachers of the deaf)

Department of Public Welfare  
Bureau of Special Medical Assistance Programs  
Cherry Wood Building  
PO Box 2675  
Harrisburg, PA 17105  
717-782-6300

Pennsylvania Office of Vocational Rehabilitation  
Hearing/Speech Program  
Labor and Industry Building  
Room 1300  
Harrisburg, PA 17105  
1-800-442-6351

## Part II

# Audiology: Resources for Rehabilitation Counselors for the Deaf and Hard of Hearing and Audiologists and Hearing Aid Fitters

I. *DEFINITIONS*

A. Hearing Loss (Hearing Impaired)

Hearing loss can be specified according to age at onset, ability to speak, etiology of the medical condition, audiometric pattern of hearing loss, whether one or both ears are affected and number of decibel.

B. Deaf

Hearing is so severely reduced that one must depend primarily upon visual communication, i.e., writing, lip reading, manual communication, or gestures. For the ordinary purposes of life, hearing is nonfunctional. The person is unable to understand spoken language through hearing, regardless of speech ability, the amount of residual hearing or help from a conventional hearing aid. Functional hearing relates to the understanding of what a person hears, not to be confused with sound sensation which most people who are deaf have in varying degrees. The evaluation of a person who is deaf should include how much spoken language he/she understands. A hearing aid may be of benefit for some functions.

C. Hard of Hearing

Hearing is impaired but not to the extent that one must depend entirely on visual communication. Speech is used, and hearing aids usually help.

D. Hearing Levels and Descriptive Names

0 to	15 dB	Normal
16 to	24 dB	Borderline
25 to	40 dB	Mild
41 to	55 dB	Moderate
56 to	70 dB	Moderate – Severe
71 to	90 dB	Severe
91 to	100 dB	Profound

E. Onset of Hearing Loss

1. Pre-Lingual: Occurred prior to the third birthday; can affect overall language development. This normally creates a severe communication handicap.
2. Pre-Vocational: Occurred after the third birthday, but prior to the eighteenth birthday.

F. Congenital Conditions

A hearing loss present at birth. Examples would include maternal rubella, heredity and disease of the newborn. Clients with a congenital hearing impairment should routinely be provided with an ophthalmological examination.

G. Degenerative or Infectious Disease: (includes meningitis, scarlet fever and diphtheria).

A condition present at birth, which does not result in a hearing loss until later in life is, for reporting purposes, caused by degenerative or infectious disease.

H. Acoustic Trauma and Ototoxicity

Traumatic cause of hearing loss, including noise-induced and ototoxic agents.

*II. EVALUATION OF HEARING*

A. Otologic Examination

The otologic examination should be obtained through an Otolaryngologist. The otologic examination should be obtained first and a copy of it should accompany the authorization for the audiologic examination. In some facilities the otological and the audiological can be done at the same time. The otologic report should be on an agency form, but other reporting formats are acceptable if the same information is present.

As part of the medical examination, a statement signed by the otologist gives approval to proceed with the consideration of hearing aids, as required by State law (Act No. 262, 1976, Article IV, Section 403).

The purpose of the otologic is to evaluate hearing for disease and surgical or medical action. If recommended by the otologist, medical or surgical services should be considered before audiologic evaluation (except if needed for medical diagnostic purposes).

The otological examination should be no more than four months old by the time a case is reviewed for provision of a hearing aid.

B. Audiologic Examination

This form includes audiological test results, report to hearing aid dispensers and hearing aid recommendation.

The audiologic examination must be completed by a licensed audiologist working in an approved audiology facility.

An audiologic is to assess hearing function, the need for amplification and aural therapy, etc. If the person benefits from a hearing aid, the audiologist will make this recommendation. If he or she already wears an aid, the audiologist can decide whether or not the present aid should be repaired, replaced, or is satisfactory. Recommendations for new earmolds also can be made.

The audiologist needs to know the hearing requirements of the client's employment as determined by the counselor.

The audiological examination should be no more than four months old by the time a case is reviewed for a hearing aid.

Occasionally it is necessary to custom fit an earmold to test a person. This shall be considered a diagnostic service, not physical restoration service.

### C. Exceptions to Required Evaluations

Provision of hearing aid repairs and establishing eligibility for services, other than hearing aid provision, are exceptions to the four-month limit.

If the four-month limit for otologic or audiologic examination is exceeded, the examining otologist and audiologist should be contacted to determine if client needs to be retested. They should state that the hearing handicap is stable and does not require retesting.

Exceptions do not apply if client has a progressive hearing impairment, or other conditions affecting stability of hearing level.

Persons who are deaf or hard of hearing often are subjected to many otologic and audiologic evaluations; rather than repeat these when the hearing problem is stable, existing information should be used if it is adequate. In these cases otologic and audiologic evaluations are usually not required except if a hearing aid is being considered. Information may already be contained in reports from (1) secondary or post-secondary records from a school for the deaf; (2) Intermediate Units/Communication Disorders Programs; (3) Hearing Conservation Programs; (4) approved speech and hearing clinics; (5) physicians and other medical specialists; (6) Pennsylvania Department of Health, Department of Education, or (7) previous OVR records.

## III. *COMMUNICATION WITH PERSONS WHO ARE DEAF OR HARD OF HEARING*

### A. Face-to-Face Communications

Clear and satisfying communications should be conducted at the individual client's preferred mode for understanding. Personal F.M. systems, audio loops or similar devices could improve communications with persons who are deaf or hard of hearing.

B. Telecommunication Devices for the Deaf (TTY)

The TTY enables a person who is deaf or hard of hearing to communicate via telephone with others possessing a TTY. When receiving TTY communications, the following should be considered:

Caller's language development may be on the third or fourth grade level.

Those unfamiliar with grammar as used by persons who are deaf could misinterpret the purpose and context of the message.

Other physical disabilities can affect ability to utilize a TTY effectively.

C. Assistive Listening Devices (ALDS)

Assistive Listening Devices (ALDS) such as personal F.M. systems, audio loops, and amplified phones may be preferred by persons who are deaf or hard of hearing.

D. Written Communications

Persons who are Deaf and Hard of Hearing should not be judged by their English language skills or mode of communication. These skills would not provide evaluation of inherent intelligence or vocational ability.

Forms such as appointment letters and written communications may not be understood by the deaf person. Personal contacts which can insure comprehension of a form's purpose are important.

Since 1990 the Commonwealth of Pennsylvania has a voice telecommunication relay service. The relay center number is VOICE 1-800-654-5988; TDD/TTY 1-800-654-5984.

*IV. SERVICES FOR PERSONS WHO ARE DEAF OR HARD OF HEARING*

A. Interpreter Services (Oral or Sign)

There are occasions when one has difficulty communicating with a person who is deaf or hard of hearing. The presence of an interpreter could insure that the individual who is deaf is aware of vocational rehabilitation services.

B. Assistive Listening Devices

Amplified phones, personal F.M. systems, audio loops, auxiliary devices, or similar electronic devices facilitate the deaf and hard of hearing in training, employment or similar situation may be provided.

C. Notetaker Services

Notetaker services provided to persons who are deaf or hard of hearing insure that they can more fully participate in the training.

V. *PROVISION OF HEARING AIDS*

A hearing conservation program is not a hearing aid purchase program. Rather, it should be concerned with all aspects of the hearing impaired person's vocational habilitation/rehabilitation. It begins by evaluating a person's auditory status. It may include provision of a hearing aid.

A. Persons who request replacement of hearing aids which they are presently using should bring the aids during the audiologic evaluation. The audiologist checks the adequacy of the present aid, which may have an effect on the recommendation for a new aid; it does not mean that he/she must get a new aid. If the client has expressed a preference for a particular brand of hearing aid this will be considered by the audiologist but will not necessarily determine the prescription regarding the hearing aid for the client.

B. When a person is referred by a hearing aid dispenser for replacement of an aid, the vendor-client relationship should be maintained, if feasible.

Hearing aids that can be considered include monaural fittings, binaural fittings, eyeglass, in-the-ear, CROS, BICROS, canal aids, bone conduction, body aids, completely and programmable aids.

However, aids which are not yet accepted as being standard in audiology, which have high costs or which have exotic aspects need firm documentation as being superior for vocational rehabilitation.

C. Canal Hearing Aids and Completely in the Canal (CIC) are relatively new on the market. They have certain advantages. However, often they do not provide adequate amplification without acoustic feedback, especially to people with markedly reduced hearing acuity.

As with In-the-Ear aids (ITE), Canal Aids and CIC aids have the individually fitted earmold as the case for the aid. However, ITE and CIC aids are placed much deeper into the ear canal, often close to the eardrum. They require that the hearing aid fitter/dispenser obtain special skill for making the fitting.

ITE and CIC aids presently are more expensive than other aids. They also may present some fitting or adaptation problems for a person, which may limit their usefulness for vocational purposes. Their being "invisible" and close to where the normal hearing person receives sound (close to the eardrum) are strong appeals for such aids.

- D. Programmable aids, also relatively recent to the market, have a higher price than standard aids. They require electronic-programming equipment by the fitter/dispenser. Their advantage is that acoustic output can be readily modified by the programming device, and changed at will to suit the wearer.
- E. As a general rule, when a person is seeking public funds for an aid or other rehabilitation measures, a sponsoring agency should seek adequate vocational benefits at lesser cost to the public. If more than one option provides adequate and equal rehabilitation the one with lesser cost should be provided.

If an agency considers customer's choice, the preferred aid should be providing the best possible benefit to the vocational environment. If the preferred aid is not as effective as another type, then customer and agency will negotiate the selection.

The agency may provide or help to provide, nearly any valid rehabilitation measure according to the agency's mission (e.g. vocational rehabilitation). Special procedures and high cost items may be considered on an individual basis assuming formal evaluations are favorable.

## VI. *AUDIOLOGY REPORT INTERPRETATIONS*

- A. In an audiologic report the subject's name, address, telephone number and the examination date are important. Also, important is the referral source in case a vendor-client relationship is to be preserved.
- B. For vocational rehabilitation the specific hearing requirements for the projected job guide the audiology test procedures. The counselor for an individual should determine vocational needs, perhaps as suggested in guidelines for hearing requirements related to vocations.

To identify the specifics of one's vocational problem, to verify such impairments and handicaps by objective test data, and to demonstrate that the recommended corrective measures are of benefit are crucial to good vocational rehabilitation and determination of disability.

As a result, special audiology tests can be specified (e.g., telephone use; localization) and authorized. One would hope the tests show significant improvement with hearing aid. LOOK and LISTEN scores tell something about how well the person understands speech by speech reading and hearing combined.

- C. Pure Tone Audiometry is a basic audiology test. It tells much about etiology, hearing aid fitting and degree of loss. It often uncovers such problems as recruitment and temporary threshold shift.

All frequencies, both air and bone conduction should be reported. If there is not a response, NR or similar notation should be made. Pure tone tests usually are accurate to within 5 dB.

The speech frequencies, 500-1000-2000, should be averaged. This average decibel (dB) value is a good indicator of the person's degree of hearing loss and should agree within a few dB with the speech recognition threshold. As a general rule, some hearing difficulty begins with more than 25 dB audiometric level, and beyond 60 to 80 dB deafness is present even though a hearing aid may help.

- D. Speech audiometry unaided is the other basic audiometric procedure. It has two main aspects.

Speech recognition threshold (SRT) is the lowest dB level at which the person can repeat 50% of the test words (e.g., baseball, outside, stairway). The dB threshold for SRT is usually accurate to within 3 dB, and should agree within 10 dB with the pure tone speech frequency average. If it doesn't there may be an unusual circumstance, and the Audiologist should be contacted regarding this.

Word recognition (discrimination) indicates the percent of words a person understands at a given dB level. Often this is called PB% because of historical reasons. The word lists are 25 to 50 words long and are single syllables (e.g., house, day, sun). Two dB levels are important.

Word recognition maximum is the best the person can do under optimum listening conditions: quiet test room and highest dB level where the percent test score is at its maximum. All three tests should be at the same Sensation Level in this series (i.e., at the same dB above the person's individual threshold for each ear (s)).

Discrimination (word recognition) at 40 dB in a sound field (test room with loudspeaker, both ears open and facing the loudspeaker) is the normal conversational level for such test conditions and is our best single indicator of how disabling a hearing problem is for speech hearing. For example, if a person doesn't understand at least 50% of the words at 40 dB, one can assume a very significant speech hearing problem exists.

One should not take the word recognition score to indicate directly the ability to understand speech in a vocational situation-other things such as visual cues contribute. That is why LOOK and LISTEN is important.

Discrimination at 40 dB with hearing aid in the test room, facing the loudspeaker indicates the results of hearing aid use. It should be better (at least 20%) than the unaided test score.

If this aided test score at 40 dB does not come close (within 10%) to the discrimination maximum, apparently best rehabilitation has not been obtained. Perhaps a more powerful aid is appropriate. The Audiologist can see the person again, or explain the results. If the aided score exceeds the discrimination maximum, so much the better.

Example: If a person obtains less than 80% word discrimination with a hearing aid, there probably are some on-the-job problems in hearing. The person will be handicapped in situations such as: instructions from supervisors, understanding people with poor speech, or accents in noisy environment, group meetings, conferences, and during job interviews.

- E. As part of a report, the type of hearing problem such as conductive or sensory neural (inner ear) helps to understand the person's problem. For example, conductive loss often can be medically or surgically treated, and hearing aids help much. Sensory neural losses too often are not amenable to medical/surgical treatment; hearing aids help but not as much as for conductive losses.

Coupled with type of hearing loss is a report of specific hearing problems. A checklist often is more efficient than a narrative report.

- F. The hearing aid recommendation often is of most immediate interest to a vocational counselor.

The actual test scores, including make and model of aid, tone settings, Speech Recognition Threshold and percent discrimination (PB%) at 40 dB are basic. PB max and tolerance level may also contribute to the hearing aid decision. As a general rule the fitting with best scores is recommended.

Whether or not an aid is recommended (and why not) is readily handled by a checklist. This gives the vocational advisor specific reasons for not following up with a hearing aid purchase.

Telephone use is so common that attention should be given to whether or not a recommended aid has a telephone pick-up (T switch).

A hearing aid recommendation, if affirmative, may be of two types.

A specific brand, model, and settings may be stated.

A generic recommendation involves a more general prescription, with the vendor to determine make and model. This requires special tests, namely Most Comfortable Level (MCL) and Loudness Discomfort Level (LDL), to determine an appropriate aid. These are in addition to pure tone and speech audiometry.

Good practice may follow one of several procedures for hearing aid advisement (usually not shown on audiology reports). Any one, or a combination, may be followed:

Test three or more hearing aids on the person's ear or ears using stock earmolds. Recommend one of those tested. This is efficient when a body or a behind the ear aid is to be recommended.

For in-the-ear aids test at least three brands, and recommend an ITE aid from one of the brands tested. Tell the vendor or the hearing aid manufacture what aid was tested and ask for an ITE with similar specifications.

An alternate procedure is to take an earmold impression and order an ITE aid for trial use. Test that aid plus at least two behind the ear aids. Recommend the best fitting. Return the ITE aid to the company within the usually thirty day return policy if it is not best.

Another ITE procedure is to test with at least one conventional aid (behind the ear) using a stock earmold. The purpose is to give the new hearing aid user a chance to listen to an aid, assess his or her interest in and acceptance of an aid, and get an initial impression as to whether an aid is of benefit.

This is after the earlier audiometric tests, including MCL and LDL. Recommend a generic hearing aid to the vendor.

If a canal aid or a CIC aid is considered, the general procedure for ITE aids should be followed.

Some Audiologists use real-ear measurements for hearing aid fitting. A set of small probe tubes is placed in the ear canal along with an aid, and acoustic measurements are made. The Audiologist determines the desired best acoustic fitting and writes a hearing aid prescription.

Regardless of the procedure used, the final hearing aid results should be reported as aided word discrimination percent score at 40dB, sound field, facing the loudspeaker.

See later sections for suggest procedures regarding CROS aids and binaural aids.

- G. Aural rehabilitation follow-up can be important to the final adjustment of a hearing aid user. Audiologists should recommend such follow-up, even though the one advising the hearing impaired person may not be able to implement this. Persons not getting an aid often benefit from aural rehabilitation training especially speech reading and/or manual communication instruction.

## *VII. FINAL CHECK OUT*

Final check out of the hearing aid or aids put on the person is important to assure that the aid is working properly and that it meets the person's needs, and to give instruction in its use.

If a hearing aid is to be purchased, it is delivered to the Audiologist, not the person to receive the aid. Many Audiologists inspect the aid and perhaps put it in a test box to verify that it is according to specifications. If not, it is sent back for replacement.

At the hearing aid check out the person's performance with the aid is compared to the initial aid evaluation, emphasizing expected results with the aid. If the aid is found to meet or exceed the client's performance with the trial aid and is judged to be appropriate, it is approved.

If the hearing aid is judged to be inappropriate, it is returned to the hearing aid dispenser with an explanation of the problem. The dispenser then decides whether to remake or cancel the order.

## *VIII. HEARING AID REPAIRS AND REPLACEMENT*

A. The four-month time limit (audiologic and otologic exams) for the provision of hearing aids may not apply to repairs. If the individual is a previous hearing aid user and case file records (otologic and audiologic) are available, that information can be utilized. It may not be necessary to provide a complete, new battery of hearing evaluations unless:

not previously evaluated otologically or audiologicaly, or

information is not available from other sources, or,

current medical conditions or noticeable change in hearing require current testing.

B. If there is evidence that the person's hearing level has changed significantly (i.e., reports that hearing level has changed or has a history of disease), a complete work-up of otologic and audiologic evaluations should be provided. It might be beneficial to discuss the case with the referring physician or the audiologist familiar with the medical or audiologic history.

C. Usage of hearing aid can also be considered, for example: type of employment such as physically active, high humidity.

One to three years – minimum life of hearing aid: Hearing aid vendor should be contacted to ascertain (usually within one year) if warranty is in effect. Expect the aid to be repaired.

Three to five years – hearing aid should be evaluated by audiologist prior to consideration of repairs.

Five year or older – client should be provided an otologic, audiologic and hearing aid evaluation.

- D. A written estimate for repairs should be obtained from the hearing aid dispenser, preferably the original hearing aid supplier. The supplier must be an approved vendor. Also, obtain a statement from the dealer concerning the warranty for repaired or reconditioned hearing aid. If the hearing aid has been repaired more than two times, it might be beneficial to consider provision of a new hearing aid.

#### IX. *AURAL REHABILITATION (AUDITORY TRAINING)*

- A. Aural rehabilitation often is desired follow-up of a hearing aid purchase. First time hearing aid users need some instruction. Number of sessions will depend on an individual evaluation of each case. For all types of aural rehabilitation, the services of a qualified and licensed therapist should be utilized. The Audiologist testing a client should indicate number of sessions and vendor.

The hearing aid dispenser should provide instruction as part of his/her service, or this may be done in the audiologic facility at the time of the hearing aid recheck. For many persons this is necessary and should not be an extra cost item. For others a more intensive outpatient program may be needed and cost authorization may be necessary.

Aural rehabilitation may include speech therapy or speech reading (lip reading) training. These therapies have related but different goals. Speech reading has to do with ability to understand others through visual clues. Speech reading training often is combined with aural rehabilitation and/or speech therapy. The procedures are interrelated and may be carried out concurrently as an integrated plan of communication rehabilitation.

- B. The purposes of aural rehabilitation are:

To teach how to take care of the mechanics of the hearing aid, i.e., inserting new batteries, checking battery voltage, wearing it on one's person, operating the controls, cleaning the earmold and receiver, protecting it from damage, and personal maintenance of the aid. Often from damage, the personal maintenance of the aid. Often this is included in Aural Rehabilitation but may be provided by a hearing aid dispenser.

To teach how to understand sounds and speech received through the hearing aid. Hearing aids provide different quality and quantity of sounds than previously experienced, and one needs to learn what they mean.

To develop skill in sound localization, telephone use, etc. These may be necessary vocational skills.

To teach how to adapt to the many varieties of sounds and sound levels experienced daily. Different settings may be required on the job than at other times, making it necessary to set the aid properly to make maximum use of it in any situation.

To learn to appreciate and to accept the advantages and the limitations of the hearing aids.

- C. Manual Communications instruction may be needed for persons who are deaf and hard of hearing, and who have not acquired this skill. Some people during their school years have had formal training in manual communication, usually ASL. Others may have picked up manual skills informally, but this may lead to improper or poor signing. Still others attended an oral school and learned good speech reading and speech skills.
- D. Each hearing impaired person should be considered a candidate for training in manual communication, especially if there is much hearing loss. Persons with progressive hearing loss, with residual speech and hearing, often are good candidates for speech reading training and aural rehabilitation to keep them communicating as their hearing gets worse.

## X. *AUDITORY AND SPEECH DEVICES*

The following devices are not routinely provided to hearing impaired clients. It is possible that in the future other similar devices will be available for rehabilitation purposes.

### A. Cochlear Implants

Over approximately the last twenty years, there have been systematic attempts to develop cochlear implants for hearing impaired people. The general approach is that external sound is detected by a microphone and amplified very much as in a conventional hearing aid. The electrical output of the amplifier is filtered through one or more narrow band-pass filters, each attached to a fine wire placed in the cochlea, eighth nerve or round window. The electrical outputs of the filters cause hearing sensation to reach the brain.

Parts of some of the instruments are imbedded in the head (usually mastoid cavity region) and work by magnetic inductance from externally worn parts. As many as twenty-two channels have been tried, although one to three channels may be used.

Individuals with severe adventitious deafness and for whom all other communications modes have been exhausted are considered for cochlear implants. There is a surgical and hearing risk involved, and by using only severely deafened individuals it is assumed little will be lost if there is an implant failure. Research is being done at the level of exploring tolerance of the body to the artificial implant, long range effects on the body because of the implant, durability of the instrumentation, configuration or number of channels and filters, and electrical/acoustical features of the stimulus to be delivered to the cochlea.

While an increasing number of research reports are available, they tend to be conservative in demonstrating dramatic hearing benefits to individuals fitted with cochlear implants. There has been no firm demonstration that high levels of speech intelligibility are restored. Rather, the research to date shows that clients may receive awareness of sound, differentiation among various sounds, and supplementation of the ability to understand when hearing is used together with lip reading. The cochlear implant does not restore speech for the deafened individual who did not have speaking skills previously. Often conventional hearing aids seem to provide as much usable hearing for the person who is deaf as do cochlear implants, and should be explored.

Cochlear implant is primarily a medical-surgical procedure. The vocational benefits to hearing impaired clients are not adequately documented. The Cochlear Implants, at present, requires the wearing of a body type electronic instrument.

#### B. Tinnitus Maskers

Tinnitus (head noise), when constant or frequently occurring, can be very disturbing. It is awareness of hearing noises or sounds, even though no external sound is present. It is generated within the ear, and ordinarily indicates some degeneration of the hearing mechanism. Tinnitus is not a specific disease and there are no specific treatments for tinnitus; the underlying conditions which cause tinnitus, if known, are treated. Vitamin therapy, special diets, reduction of salt intake, and so forth have been tried with varying degrees of success. Tinnitus may occur with or without hearing loss, although usually at least some loss is present.

An instrument called Tinnitus Masker is on the market. Its physical appearance is very similar to a behind-the-ear hearing aid, but there is not a microphone to pick up sounds. It has an internal electronic circuit which generates a noise controlled for loudness and frequency. Only the electronically-generated sound is delivered to the ear canal. The subject hears this sound, which is a version of white noise or tones.

The Tinnitus Marker is intended to provide a more acceptable and less disturbing sound than the internal tinnitus. The general theory is that this artificially introduced sound will mask or overcome the perception of tinnitus. (In selected cases a regular hearing aid, even if hearing loss is minimal, has a similar effect).

Factors when considering a Tinnitus Masker for client includes:

Less than half those who have tinnitus and for whom preliminary measurements seem to indicate a Tinnitus Masker, have benefited from such an instrument.

A Tinnitus Masker might have the adverse effect of inducing more head noise or more hearing loss than the client had previously.

We have no data on the vocational benefits from the use of a Tinnitus Masker.

The initial cost and maintenance of a Tinnitus Masker are similar to those of a hearing aid.

- C. Tactile devices which provide vibratory stimulation to the skin in response to sound have a long history. They are similar to a bone conduction hearing aid and vibrator, but may have an number of frequency channels.

Tactile stimulation, with training, can provide awareness of sound, and some cues which assist speech reading.

These instruments are for the severely deafened.

- D. Bone Conduction Implant

An implant of the bone conduction electromagnetic prosthetic hearing device makes effective sound conduction possible for patients with certain types of hearing impairment. The device consists of a temporal bone implant and an externally worn sound processor. The bone conduction device allows transfer of electromagnetic energy from the processor to vibration in the skull to the inner ear. Depending upon the patient's inner ear capacity, this device may improve hearing to a socially functional level.

The user Bone Conductor hearing aid has an oscillator held by a spring head band against the mastoid bone.

## *XI. LICENSING*

- A. In Pennsylvania Hearing Aid Dealers and Fitters are registered. Audiologists Speech Pathologists and Teachers of the Deaf in private practice are licensed. Only such persons should be used in a vocational rehabilitation program. State agencies should use only agency approved audiology facilities.

B. Audiologists/Dispensers

Audiologists/Dispensers who test a person can be considered to be the hearing aid dispenser for persons tested at that facility.

*XII. TEST RELIABILITY*

A. When considering any of the hearing test scores on an audiology report consider the reliability or accuracy of hearing tests:

Pure Tone Audiometry Thresholds are accurate within plus or minus 5 dB. Test to retest differences no more than 5 dB should be considered to be non-significant, unless all thresholds on a retest are consistently 5 dB or more different than thresholds on the previous test. In this case a small but consistent trend could be noted for better or worse hearing.

Speech reception thresholds have a test reliability of approximately 3 dB. Test scores differing less than 3 dB should be considered to be the same. However, when observing changes in speech reception thresholds for hearing aid evaluations, differences in SRT less than 10 dB are of little significance, and ordinarily a hearing aid should give at least 20 dB improvement in speech reception threshold to justify its use.

For speech discrimination test error is normally about 10%, and differences in test to retest scores less than 10% are not important. For hearing aid use, an aid should give at least 20% improvement in discrimination score for an aid to be justified.

For some persons there will be noticeable improvement in one area (such as speech discrimination) but minimal in another area (such as speech reception threshold). Also, a hearing aid may give the client only a small amount of improvement in these aspects of hearing, but demonstrate considerable and vocationally significant benefits in areas such as auditory localization or speech reading. The overall pattern of benefit from a hearing aid should be considered, rather than a decision made because a single test score does not show adequate benefit.

B. When evaluating an audiological examination for severity of handicap, the pure tone audiometric as well as the speech reception data are considered.

A client with less than 40 dB three frequency hearing level average (25% AAOO method) for the better ear would not be considered significantly impaired. However, even a mild hearing loss can, in some instances if coupled with other problems, cause a significant vocational handicap.

If the binaural unaided speech reception threshold is worse than 55 dB the client can be considered to be severely handicapped in hearing.

If the client's unaided speech discrimination for 40 dB Hearing Level (reference normal conversational level) is less than 50% the client can be considered severely handicapped in hearing.

- C. Translating the test data into severity of vocational disability is the responsibility of the rehabilitation counselor. A hearing aid or other vocational rehabilitation service is to be provided the client on the basis of disability rather than on severity of test scores.
- D. Some audiologists routinely test speech or hearing only in noise both with and without hearing aid, and report only these data. This by itself is not acceptable, but may be reported in addition to testing in quiet.
- E. The Pennsylvania OVR does not specify the audiological procedure for selecting or fitting a hearing aid. The audiologist is free to use whatever ethical method he or she prefers. The intents of the audiology report form are:

Show the audiological status of an individual to include hearing impairment and hearing handicap.

Document the results of hearing aid fittings.

Obtain the audiologist's professional opinion regarding providing a hearing aid and other rehabilitation procedures.

Provide an opportunity for recommending follow-up procedures and to detect related problems.

### *XIII. HEARING AID CHECK OUT*

*Good practice requires a hearing aid check out. It is done by the Audiologist when the person returns to receive the hearing aid and after it has been received by the clinic from the dealer.*

- A. The basic responsibility in this check out is to assure that:

A new hearing aid has been provided.

The earmold is the proper kind and it fits correctly.

The hearing aid and earmold meet the recommendation provided earlier.

The hearing aid that is to be provided gives a close approximation of the results obtained earlier. The hearing aid, including battery replacement, putting on the aid, and adjusting its controls are explained.

- B. The Audiologist need not complete a full audiological work-up for a hearing aid check out. Commonly the clinic will repeat aided speech reception threshold and aided speech discrimination scores to check these for agreement with the earlier test. The audiologist should verify that the hearing aid produces the expected results for other hearing functions such as localization or telephone listening.

If the hearing aid does not meet the requirements, it should be rejected and sent back to the dealer with a notation that it needs to be replaced with a properly operating hearing aid meeting the prescription. The audiologist may call the dealer and immediately obtain a replacement aid for check out.

When a hearing aid check out report indicates that a properly fitting aid is provided the client, authorization for payment to the dealer should be given.

Any variation between the prescribed hearing aid and the hearing aid to be provided should be approved by the audiologist.

When a Dispenser sends a hearing aid to the audiology clinic, but before it is given to the client, we assume that aid is the responsibility of the audiology clinic. If it is the clinic's responsibility to replace it. When the aid is dispensed, it becomes the property of the person who has the responsibility for care and maintenance, except as other arrangements might be made.

#### *XIV. HEARING CONSERVATION PROGRAM POSITION PAPERS*

In all of the following problem situations documentation must be available to justify the hearing aid provision. We cannot rely only on subjective recommendations. Rather, we need at least some objective test scores which demonstrate changes that can be related to vocational adjustment improvement.

A person may have a hearing defect which is only partially corrected by a hearing aid, leaving a residual vocational handicap. The hearing aid may be justified because of the help it gives, but the person may need additional services to achieve more normal communication function.

Level of word recognition (discrimination test score) is particularly important in deciding the need for additional hearing related services. The lower limit of normal word recognition is 90%.

In vocational and other life situations a person usually combines hearing and speech reading (lip reading). The two methods of receiving speech complement each other. A hearing impaired client who has a hearing aid that gives speech intelligibility below 80% (i.e., below an adequate level) may be able to obtain a more desirable level of functioning by combining speech reading and hearing.

If by hearing alone a client obtains less than 20% speech intelligibility even with a hearing aid, it is doubtful that an aid should be recommended because of its very limited usefulness for the hearing of speech. However, if other benefits from wearing an aid are clearly demonstrated and adequately documented, a hearing aid may be justified and approved for the client.

A special concern is the person who has just acquired a first hearing aid. Especially with a sensori-neural loss, one often has problems adjusting to the aid and is frequently in need of additional audiologic help, including instructions in the care of the aid, in simple trouble-shooting, in learning the benefits and limitations of the aid and in auditory training (all in addition to speech reading training).

All of the tests in the following can be done using standard word recognition lists or procedures. However, the same type of stimuli and procedures for all tests in a series should be used to obtain comparable data.

#### A. Look and Listen Testing

With the most helpful hearing aid the client obtains a word recognition (discrimination) score above 80% for test words presented at 40 dB Hearing Level re threshold for normals. Assume, in the absence of information to the contrary, that adequate speech hearing has been obtained for most purposes. The hearing aid should be recommended. Follow-up speech reading is not usually indicated, unless there seems to be special need.

If the most helpful hearing aid word recognition (discrimination) score is below 80%, repeat the discrimination test using both hearing aid and speech reading together to obtain AIDED LOOK AND LISTEN SCORE. Test with conversation voices at six feet, face in view, and hearing aid in use (or use speech audiometer, with subject viewing the speaker through sound room window and with voice monitored to 40 dB HL).

If aided Look and Listen score is 80%, test for speech reading (Look Score) unaided. Test six feet from client, full face visible, but without using voice or using only a soft whisper and no hearing aid (or test with client watching through control room window).

Obtain combined speech reading and hearing score at 40 dB HL without hearing aid (unaided Look and Listen score). Test six feet from client, full face, using normal voice and no hearing aid (or test with client watching through control room window).

The relative usefulness of hearing and of speech reading should be considered:

If the person seems to have little speech reading ability and the aided hearing is not normal, recommend speech reading and auditory training therapy along with the hearing aid.

If person seems to have little speech reading ability and the aided intelligibility score is low (below 20%) compare Look and Listen with unaided Look and Listen: does the variable of aid or no aid make a significant difference? If no, be conservative about recommending a hearing aid but strongly recommend a speech reading or other programs.

If the person is a first-time hearing aid user, and seems to have difficulty adjusting to an aid even though speech intelligibility scores are high, recommend a program of speech reading and/or auditory training with the hearing aid.

#### B. Evaluating Unilateral Hearing Loss (CROS Aids)

If a person has unilateral loss, or much more loss on one side than on the other, the vocational problem is that he/she cannot hear sound from the bad side, and a CROS fitting is considered.

Do the standard speech reception tests with the client directly facing the loudspeaker source of sound. Then, position the client with bad ear toward the sound source, good ear not occluded or masked. Obtain discrimination score unaided. Put on the CROS hearing aid with microphone on bad-ear side and test again with that side toward the sound source.

It may be advisable to test with bad ear toward the sound source and good ear occluded when evaluating CROS hearing aids. However, hearing aid on the bad ear, good ear not occluded, both with bad ear toward sound source and while facing the sound source, are final test conditions that are needed.

The unaided versus the aided set of scores will give some indication as to whether the hearing is better for sound coming from the bad side when using the CROS aid, and can be compared with the face-front scores.

Out data suggest that probably no more than half of the people provided a CROS aid by a vocational rehabilitation agency continue to use the aid.

#### C. Sound Localization Testing

This may be a unilateral loss or a bilateral loss case. The hearing loss may be severe or not. A standard monaural aid, a CROS aid, or a binaural fitting aid may be considered. The question is whether or not auditory localization is improved with a hearing aid fitting.

The research data are weak on demonstrating that localization of sound, especially from the bad side, is helped with the CROS aid. Hearing the sound from the bad side is not the same as localization, and the two problems should be separated in case work-up.

Because there are not convenient and standardized tests for auditory localization, do informal procedures.

*Assume at least two loudspeakers in the test room separated by 90 degrees. Position the client to face between the two speakers, and at the usual test distances. Use a comfortable listening loudness (40 dB above normal auditory threshold in the test situation). Without hearing aid, present a series of 10 to 20 speech stimuli all at the same dB level randomly from speaker to speaker. The client indicates from which speaker the sound comes. Using spondee words with carrier phrase would be adequate. Note the percentage of correct loudspeaker localizations. Repeat with various listener – loudspeaker positions.*

Then provide a hearing aid and repeat the procedure to obtain score that can be compared with the unaided localization score.

Another possibility is to place the client in the middle of a room, eyes closed. Move around to various positions (equal distance) calling spondee words with carrier phrase, and using 10 to 20 trials. Note the number of correct identifications sound source, not using amplification. Repeat with hearing aid.

In each of the above, although crude and informal, there would be some data available as to the accuracy of auditory localization with and without hearing aid.

#### D. Difficulty Hearing in Noise

Everybody has some difficulty hearing in noise, so this in itself is not a hearing aid justification. The need is to document that the hearing aid helps the noise-hearing if that is true.

We have difficulty specifying a standard test for ability to hear in noise. Problems involve signal-to-noise ratios, sound levels for testing, type of noise to use, and sound sources.

Assume a two-channel speech audiometer, with loudspeakers positioned 90 degrees apart. Have client face the loudspeaker which will present the speech signal. Subject wears hearing aid. Present a list of intelligibility test items from that speaker at approximately 40 dB (52 to 54 dB SPL) with noise from the other speaker which is 90 degrees off the subject's front. Obtain intelligibility score. Do this with the person facing the speaker to the left, noise from the right, and repeat facing the speaker to the right, noise from the left. Repeat the procedure without hearing aid to obtain a base, unaided, test score.

This is a 0 dB signal-to-noise ratio test in terms of sound pressure level. It produces approximately 50% speech discrimination for normals, allowing for maximum test score variation in either direction.

E. Telephone Listening Testing

Using an extension telephone, give a list of discrimination test words over the telephone unaided, and again aided. Compare percent scores.

Because telephone use is common in work situations it is prudent to fit an aid to the ear on the side of the less dominant hand, allowing the dominant hand to take notes, etc.

F. Most Comfortable Loudness (MCL)

Most Comfortable Loudness (MCL) is related to the client's vocational use of hearing and to a generic hearing aid prescription.

Assume the testing context is for the typical quiet job situation. If the job is in noise, make the MCL judgment as if listening to a supervisor or fellow employee in a quiet office or rest lounge.

MCL is the preferred speech listening level in dB HL for the best combination of:

Easiest to understand what is said (even if not completely understood).

Minimal for strain of understanding what is being said.

Comfortable to listen to with respect to loudness, clarity or crispness, lack of distortion and of best sound quality or naturalness.

Obtain MCL under earphone for each ear to be fit for continuous speech (live or recorded) or use a string of spondee words with carrier phrase.

The definition of MCL should be given to the client, with instructions to motion to the audiologist to raise or lower the speech signal during the MCL test, and might be preceded by "Tell me when my voice is at a most comfortable level, that point at which it becomes clear and distinct".

The MCL should be arrived at by bracketing:

Adjust the speech signals upward in 5 dB steps until it is louder than comfortable. Then adjust the signal down until it is softer than comfortable. The MCL is between these two levels, and is obtained by small up and down adjustments.

Repeat at least three times to arrive at the most common MCL.

Speech awareness, pure tones, warble tones, or other signals such as music or noises are not acceptable for determining MCL except when directly job related, and in addition to testing for MCL with speech in quiet.

G. Loudness Discomfort Level (LDL)

LDL is related to the client's vocational use of hearing and for a generic hearing aid prescription. It may also be called upper loudness level (ULL), uncomfortable listening level (ULL), discomfort level (DL) or threshold of discomfort (TD). LDL is usually of lower dB level and not the same as threshold or feeling or pain (about 130 to 140 dB SPL in normals) or tolerance, even though they may be close together. Assume the testing context is for the typical quiet job situation. If the job is in noise, make the LDL judgment as if listening to a supervisor or fellow employee in a quiet office or rest lounge.

LDL is the threshold of being too loud in dB HL and described as characterized by:

The level at which speech is louder than one would like it to be, and too loud to listen to for a period of time.

Just beginning to cause jumpiness or noticeable discomfort because of excessive loudness.

Causing noticeable stress for hearing because speech is uncomfortably loud for continued listening.

Obtain LDL under earphone for each ear to be fitted with an aid using continuous speech (live or recorded) or a string of spondee words with carrier phrase.

The definition of LDL should be given to the client, with instructions to motion to the audiologist to raise the speech signal (ascending technique) until it is at LDL. The test might be preceded by, "I will gradually increase the level of my voice. Please signal when it becomes so loud that it is uncomfortably loud to listen to for a period of time".

Begin with the dB HL of the speech below discomfort, such as the MCL.

Adjust the speech gradually upward until the client indicates discomfort.

Quickly lower the speech to reduce discomfort and aural fatigue, and to avoid aural damage.

Repeat ascending trials at least three times to obtain a most common level, which is the LDL discomfort level.

When warble tone LDL's are needed, in addition to speech LDL's, the procedures should be the same as for speech.

Cautions in the LDL procedure include short exposure to discomfort levels, aural rest if tinnitus is stimulated, don't exceed the LDL level of stimulation, allow time for recovery if TTS is observed (this is to be a rested LDL) and discontinue the LDL procedure if the client complains, gets dizzy, or if nystagmus is observed.

It is best to do the LDL procedure at the end of the clinical testing session so as not to have aural fatigue, TTS or client annoyance which may interfere with other clinical tests.

#### H. Audiogram "Averaging" Techniques

3 Frequency Average

Sum thresholds at 500 Hz, 1000 Hz, 2000 Hz

Divide by 3

Sum the best two thresholds for 500 Hz, 1000 Hz, 2000 Hz

Divide by 2

Single or monaural ear averages: use thresholds of each ear separately for 3 frequency of for 2 frequency average.

Better ear average: better threshold at each frequency regardless of ear for 3 frequency or for 2 frequency average.

AA00 Percent (American Academy Otology and Otolaryngology)

Take average hearing threshold level in each ear (single ear averages) across frequency 500, 1000, 2000 and 3000 Hz.

Subtract 25 dB to get net hearing level or impairment for each ear.

Multiply net hearing level in each ear by 1.5 to get the monaural percentage of impairment for each ear.

Multiply the lesser monaural percentage of impairment by 5 and add this product to the greater monaural percentage of impairment. Divide the result by 6 to get the binaural percentage of hearing handicap.

## I. Binaural Hearing Aid Fittings

Binaural Hearing Aid fittings do not have special qualifications for one to be eligible to receive binaural fitting, other than vocational need and audiological benefit. Research shows unfortunately that many binaural hearing aid purchasers discontinue binaural use because benefits do not outweigh the bother.

Vocational needs include auditory localization, hearing in noise, or improved threshold or discrimination with binaural versus monaural aids. A CROS, BICROS, MULTICROS type of hearing aid is not considered a binaural fitting.

A binaural hearing aid fitting needs to be documented as being of more benefit acoustically and vocationally than a monaural fitting. To provide this documentation the audiologic tests should include at least the usual left and right ear air and bone conduction thresholds, left, right and binaural SRT and PB Max scores, sound field (binaural) speech discrimination for 40 dB hearing level reference normal from zero degree azimuth (client facing speaker), and aided speech discrimination and SRT.

For binaural fitting recommendations we should have aided right ear only threshold and discrimination, aided left ear only threshold and discrimination, and aided binaural threshold and discrimination.

Because having duplicate aids for binaural testing is not ordinarily feasible, test with one of the recommended aids on each ear independently for left and right scores and use the same aid together with a close equivalent on the other ear for the binaural testing. The final recommendation might be for two instruments of the same make and model on the assumption that the testing was adequately valid for the client.

Occasionally a person has a single aid and now is being recommended for another aid to provide binaural fitting. Assuming the client's present aid is in good working order, the series of tests would be done for left, right and binaural using the client's own aid and clinical trial aids on the other ear. This is a binaural fitting though only one new hearing aid is being provided.

In the case of experienced and continuous binaural hearing aid users a new binaural fitting can be justified even though its advantages are not clearly identified.

If auditory localization, hearing in noise or other specific benefits for binaural fitting are presumed, these benefits should be documented by audiologic test procedures.

## J. Hearing Level, Hearing Loss and Sensation Level

Hearing Level (HL) is the dB notation on the vertical borders of an audiogram chart or in the boxes in an audiology report.

Zero dB is the normal average threshold of hearing for pure tones or for speech recognition threshold. If a client's threshold, for example, is 60 dB the person requires 60 dB more than 0 dB of sound to just hear.

For vocational purposes Hearing Level is of special interest because it relates to how the person hears in the everyday world of work in comparison to normals.

Hearing Loss (HL) is the change in dB threshold from a previous threshold. Suppose a person originally had 0 dB threshold. Later the threshold was 60 dB. There now is a 60 dB Hearing Loss (same as Hearing Level). But suppose the person started out with a 10 dB Hearing Level and later went to 60 dB Hearing Level. That would be a 50 dB Hearing Loss.

Usually we don't know the true Hearing Loss because we don't know the person's threshold before on-set of ear disease. If we assume everybody had 0 dB Hearing Level to begin with, a person's audiometric Hearing Level is the Hearing Loss.

Hearing Level and Hearing Loss often are used interchangeably. Consider them to be the same for general use.

Sensation Level (SL) is dB of sound more than the person's individual threshold whatever dB HL that may be. It is a practical way to equalize loudness of sound, especially for word recognition or discrimination tests.

In general, because louder speech is understood better than softer speech, percent speech discrimination or word recognition is dependent on loudness. Many people with hearing loss never reach 100% because of defective ears. For some, increasing loudness may decrease intelligibility once their individual maximum is reached (this is often called "roll-off").

It is well documented that speech 40 dB louder than threshold in a given environment usually produces maximum word intelligibility. Less loud speech goes down about 2% in intelligibility for each dB reduction in loudness.

A good policy is to give the person 40 dB of loudness more than that person's threshold for the specific ear(s) being tested for discrimination; that is 40 dB Sensation Level (SL).

This technique tends to equalize the loudness factor, especially when looking for discrimination maximum. It produces test scores relatively free from the loudness effect. This test scores can be compared directly for right, left, and binaural maximum word intelligibility.