

Alternative Listening Devices and Delivery Systems for Audiologic Habilitation of Hearing-Impaired Persons

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Many persons with hearing impairments have difficulty in understanding speech in noisy environments. Hearing aids often do not offer satisfactory solutions in group situations because of background noise or distance from the speaker. Until recently, only minimal attention has been focused on the inadequacies of listening/talking environments for persons with hearing impairments and the talkers who wish to communicate with them. The problem of inadequate listening/talking environments has been addressed through identification of alternative and companion listening devices. These devices provide an advantageous signal-to-noise ratio by delivering the speech signal directly to the ear of the listener. They are portable, wearable, and commercially available in a wide price range; and they do not require permanent installations or architectural modifications. These listening devices are called Situational/Personal Acoustic Communication Equipment (SPACE). Because of travel barriers inherent in traditional programs, alternative telephonic delivery systems have been developed that combine Face-to-Face; TEL-Communicology (TEL-C) and Remote Machine-Assisted Treatment and Evaluation (REMATE), a telephonic computer-based drill program. TEL-C and REMATE provide services in spoken, written, typed, and Touchtone® modes for clients on a nationwide basis who need supplementary speech and language treatment and evaluation or audiologic rehabilitation.

At a time when there is a growing demand for more satisfaction from

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life, large numbers of hearing impaired people find the quality of their lives profoundly diminished.

Many disabilities handicap us in our environment, but hearing impairment strikes at the very essence of being human—it hinders communication with other human beings. It restricts our ability to be productive and to engage in social intercourse. It reduces our constructive use of leisure time. Hearing loss often leads to poor self-image (particularly among the elderly), to isolation, and to despair. It affects our mental and physical health and, ultimately, our will to live. . . .

As we move from an industrial to an information society, the key resource becomes what is in our heads. But what is in our heads today, and will be tomorrow, gets there largely in the sound mode. As the telephone, radio, and television brought new access of information to most people, they posed increasingly difficult problems for older persons with hearing loss. In the “global village” of our electronic world, hearing impaired people live in the ghetto. (Stone, 1981, p. 1).

ALTERNATIVE AND COMPANION LISTENING DEVICES

Rationale

Many persons with hearing impairments have difficulty in understanding speech in noisy environments. Hearing aids often do not offer satisfactory solutions in group situations because of background noise or distance from the speaker. Until recently, only peripheral concern has been given to the inadequacies of listening/talking environments for persons with hearing impairments and for the talkers who wish to communicate with them.

The hearing aid industry has responded to the demand of hearing aid users for small, inconspicuous devices. The reduction in size has increased the cost and has resulted in certain limitations. It is imperative that greater attention be focused on communication-centered environments and effective listener/talker devices, not only for the hearing impaired but also for normally hearing persons.

Listeners'/Talkers' Rights

Although some attention is being given to the rights of the hearing impaired to be able to receive and utilize optimal speech signals, the rights of *talkers* to be understood have been overlooked. Good communication involves both the expression and reception of ideas. It involves listening/talking environments in which it is possible to discuss, object, offer alternatives, express feelings, elaborate concepts, and carry on the many other aspects of interper-

sonal verbal exchange. When noise interferes with talkers'/listeners' rights to easy effective communication, many interpersonal misunderstandings result. Listeners and talkers should be able to meet basic communication needs, exchange ideas, and enjoy one another's company. The *quality of life* for both listeners and talkers may be dependent upon the *quality of communication*.

Communication-Centered Environments

The majority of existing clinical, residential, educational, vocational, and recreational environments are *not* communication centered. Achieving satisfactory listening/talking environments becomes even more complicated when several listeners have hearing losses that require the use of amplification. Numerous hearing aid users complain about (a) the difficulties they experience in understanding speech in noisy environments and (b) the resulting impact on interpersonal communication that causes them to alter their lifestyles.

IDENTIFICATION OF AMPLIFICATION DEVICES

The problem of inadequate listening/talking environments has been addressed through identification of alternative and companion listening devices. These devices provide an advantageous signal-to-noise ratio by delivering the speech signal directly to the ear of the listener. They are portable, wearable, and accessible at a broad price range from \$50 to \$1,000 for hardwire to FM units, respectively. They are commercially available and do not require any permanent installations or architectural modification. These listening devices are referred to as Situational/Personal Acoustic Communication Equipment (SPACE).¹

Three special considerations for individuals utilizing SPACE devices include: location of the microphone, use of a windscreen, and self-wiring. The placement of the microphone is determined by the signal-to-noise ratio. Because of the characteristics of the microphone, it is possible in most listening/talking environments to achieve good reception even when the microphone is at a considerable distance from the talker. Background noise and vibration are reduced when the microphone is placed within a windscreen. Windscreens that are used for sound level meters and for out-of-doors interviews prove to be very effective in the use of SPACE devices.

Self-wiring the listener offers greater mobility and eliminates the need for attaching a microphone to the talker. The listener can (a) locate the microphone on her/his collar, tie, belt, or other appropriate location and (b) put the amplifier or transmitter in a pocket or pocketbook. Small carrying pouches can also be utilized under the clothing as long as the listener has easy access to

¹For further information on SPACE devices contact the authors.

the controls. Being self-wired permits listeners to function well in one-to-one communication and in small groups even when the listeners and talkers are in noisy environments.

HARDWIRE OPTIONS (HO)

SPACE HO-1

SPACE HO-1 devices are helpful to hearing-impaired listeners with mild to severe losses who have difficulty in understanding television and radio. They can also be useful for normally hearing persons who wish to enjoy private listening. Although these devices require that the sound source have a listening jack, they do not require any modifications of the sound source itself and their cost is very reasonable.

The components of SPACE HO-1 devices include a stethoscope earphone or a personal snap-in earmold and an optional extension cord. For improved listening with stereo, more expensive stereo earphones can be substituted. The extension cord allows the listener to be seated at a distance from the sound source. Manufacturers often provide earplugs for use with television and radio. The earplug and earmold provide monaural listening only, whereas the stethoscope provides bilateral (Y-cord) reception.

One of the greatest sources of friction between hearing-impaired and normally hearing listeners is the turning up of the volume on televisions and radios by hearing-impaired persons. SPACE HO-1 devices help overcome some of these difficulties.

SPACE HO-2

SPACE HO-2 devices are low-priced, easily available amplification devices to be used as alternative or companion amplification systems. They serve listeners with mild to severe hearing losses who wish to (a) engage in private listening of television and radio when their equipment has *no* private listening jack, (b) enhance one-to-one and small-group communication in noisy environments, such as restaurants and clinical settings; and (c) amplify telephone reception. Normally hearing listeners can also utilize SPACE HO-2 devices for private listening.

Components of the SPACE HO-2 devices are a stethoscope earphone or personal earmold, amplifier, microphone, and optional extension cord. Also included are a windscreen for reducing noise and vibration and a magnetic earpiece for amplifying telephone reception. A nine-volt battery for the amplifier and a #675 or #76 hearing aid battery for the microphone are required.

Although the stethoscope earphone provides superior listening for most persons, the snap-in receiver of the stethoscope can be snapped into a personal earmold. Most listeners report that the bilateral (Y-cord) listening is

better because it provides a signal to both ears while reducing background noise. The amplifier of this SPACE is small and can be held in the hand, put in a pocket, or placed on a table. The controls are large enough for easy adjustment. The wires can be bound with a plastic bag twist tie or rubber band and placed in a pocket. When the SPACE HO-2 is used with a media source such as television or radio, the microphone should be placed as close as possible to the loudspeaker. The extension cord allows the listener to sit at a greater distance from the sound source.

Persons with mild to moderate hearing losses can utilize these devices to enable their participation in small groups if they are self-wired or in medium-sized groups if they use a windscreen over the microphone and place the microphone in the center of the group. Self-wiring consists of placing both the reception and transmission devices on the listener. The microphone will pick up speech over varying distances from the listener, depending upon the signal-to-noise ratios.

SPACE HO-2 is useful as part-time or occasional amplification for hearing aid users who need a companion system for listening to media or talkers in noisy environments. It can also serve in place of a hearing aid for persons who are not good candidates for the traditional hearing aid and for those who cannot afford more expensive devices.

The amplifier and microphone can be used as a voice amplifier. The amplifier and the magnetic earpiece can be coupled to the earpiece of the telephone for amplified reception. It serves one listener if the stethoscope is plugged in, or it serves many listeners if the amplifier is used without the stethoscope.

SPACE HO-3 and HO-4

These devices are useful to listeners with mild to severe hearing losses. They are designed for listening to television or radio. SPACE HO-3 plugs into a private listening jack and into a personal ear level hearing aid with external input capability. SPACE HO-4 utilizes the same type of connection as SPACE HO-3 but devices plug into personal body hearing aids with external input capabilities. An extension cord may be used in order that the listener can be located at a distance from the sound source. Both SPACE HO-3 and HO-4 devices require no modification of media equipment since they can be plugged into the listening jack of the television.

If a magnetic pickup and SPACE HO-3 or HO-4 devices are connected to the amplifier of SPACE HO-2, the unit may be coupled to the telephone and used as a telephone amplifier. If the microphone and amplifier of SPACE HO-2 are added to SPACE HO-3 and HO-4 devices, television and radio sets without private listening jacks become accessible to hearing-impaired persons.

The windscreen is helpful when the microphone is placed in the center of

the table for middle-sized groups whose members wish to communicate with hearing-impaired persons in noisy environments. The cost is the same as for other hearing aids plus the SPACE HO-2 if a combined system is desired.

INFRARED OPTIONS (IO)

SPACE IO-1, IO-2, IO-3, and IO-4

These infrared devices are helpful for hearing-impaired listeners with mild to severe hearing losses who have difficulty in understanding television and radio. The infrared transmitter requires a jack at the sound source and an AC outlet. A distinct advantage of infrared devices is that they do not require a license or permit to be operated.

Several sizes of infrared devices are available for use in theaters, churches, and conference areas. Since background noise in these environments is a problem even to normally hearing persons, infrared systems show promise of enhancing listening for almost everyone with sufficient hearing to benefit from amplification. The level of amplification is controlled at the receiver.

All infrared systems use a transmitter. The size of the listening area determines the size and thus the cost of the transmitter. The location of the transmitter is crucial, since objects in front of the listener can cast shadows, thus blocking reception. The transmitter(s) have to be placed sufficiently high on the wall for the eye of the receiver to be in view of the transmitter. The transmitter is plugged into a public address system.

Infrared receivers IO-1 to IO-4 offer the following choices:

1. IO-1: Stethoscope and receiver
2. IO-2: Bar-neck loop receiver and personal ear level hearing aid with telecoil
3. IO-3: Bar receiver, cable, and personal ear level hearing aid with an external input capability
4. IO-4: Stereo transmitter and stereo headset receiver

Infrared receivers are recharged by plugging the small battery into an AC outlet. These systems are more expensive than hardwire systems and less expensive than FM systems. Although they provide effective listening in facilities where transmitters have been installed, the earphones are not useful to listeners except in locations where infrared is operational.

Some theaters in which infrared has been installed rent receivers to both normally hearing and hearing-impaired listeners. Upon entrance, the entire cost of the device is charged to the listener's credit card. When the earphone is returned, the charge is reduced to a small rental fee.

FM-TO-AUDITORY TRAINER OPTIONS (FMATO)

SPACE FMATO-1, FMATO-2, and FMATO-3

SPACE FMATO-1 and 2 devices are effective amplification for hearing-impaired persons with mild to severe losses. SPACE FMATO-1 is actually

designed to be used with SPACE FMHAO devices that are coupled to the listener's personal hearing aid. Internal adjustment can be made, however, so that SPACE FMATO-1 becomes appropriate for use by persons with mild to moderate and, in some cases, severe hearing loss.

SPACE FMATO-2 utilizes two earmolds and can serve as an FM receiver, a body hearing aid, or a combination of FM receiver and body aid. Some listeners who could benefit from this device object to wearing two cords between the receiver and the earmolds. SPACE FMATO-1 has just one cord, but it does not provide nearly the power of SPACE FMATO-2.

The components of SPACE FMATO-1 and 2 devices consist of an FM transmitter and FM receiver at the same frequency. The frequency of the receiver can be switched easily from one to another by exchanging crystals. Crystals are inexpensive and can be plugged into the receiver. Unless SPACE FMATO-3 is in use, only one transmitter per channel can be utilized with the FM transmission range of about 300 feet. A recent development in FM systems makes it possible for transmitters on different frequencies to be received by a common mixer that retransmits on one or more frequencies. This permits a number of talkers, such as actors or speakers on a panel, to transmit at the same time.

FM-TO-HEARING AID OPTIONS (FMHAO)

SPACE FMHAO-1, FMHAO-3, and FMHAO-4

SPACE FMHAO devices are designed to use FM transmitters, FM receivers, and personal hearing aids. The level of amplification is controlled by the personal hearing aid.

The SPACE FMHAO devices offer the following choices:

1. FMHAO-1: Microphone, FM transmitter, FM receiver with an acoustic (acoustic) coupler, batteries (can be used with any personal ear level hearing aid)
2. FMHAO-2: Microphone, FM transmitter, FM receiver with cables compatible with plug or boot of hearing aid, batteries (can be used with any personal ear level hearing aid with an external input capability)
3. FMHAO-3: Microphone, FM transmitter, FM receiver with velcro loop (magnetic) adaptor, batteries (can be used with any ear level or body hearing aid with telecoil)
4. FMHAO-4: Microphone, FM transmitter, FM receiver with neck loop (magnetic) for wearing under clothing, batteries (can be used with any ear level or body aid with telecoil)

Application of SPACE FMATO and FMHAO Devices

When utilizing SPACE FMATO and FMHAO devices, their effectiveness can be enhanced by placing the microphone close to the source and extending the cord between the microphone and transmitter as much as possible, since the cord also serves as an antenna and extends the range of the system.

The receiver can be attached to an earmold or to a stethoscope earphone. SPACE FMATO-1 can be used with the stethoscope earphone by listeners who do not object to the appearance of the stethoscope, and who benefit from Y-cord listening. SPACE FMATO-2 provides bilateral listening for persons with severe to profound losses.

All of the SPACE FMATO and FMHAO receivers can utilize any of the 32 FM frequencies and any of the FM transmitters at the same frequency.

Although the FM devices are much more expensive than SPACE HO-1 and HO-2, they provide greater mobility, more potential power, and do not confine the listener because of cords between the talker and listener. They can be used in theaters, churches, conference halls, and sports arenas. They can transmit to larger areas than the SPACE IO devices. In order to avoid any overlap or eavesdropping outside of the desired listening range, persons located in adjacent areas should use different frequencies.

The FM auditory trainers have been used in classrooms for hearing-impaired students, but the application of FM to personal/social environments for these students or for adults has not been explored until recently. Uses of the FM systems include the following:

1. One talker to one listener
2. One talker to any number of listeners (each listener has a receiver on the same frequency)
3. Small group of talkers utilizing several microphones of different frequencies with a common mixer such as that in SPACE FMATO-3, that can retransmit on several frequencies
4. Medium-sized group of talkers using a microphone in a windscreen strategically placed for optimal signal-to-noise ratio and any number of listeners with receivers
5. One talker with a telephone to one-or-more listeners with a transmitter coupled to the telephone by a magnetic earpiece
6. One listener self-wired by clipping the microphone to a collar, tie, belt, or some other appropriate location

Placement of the microphone is particularly critical for the SPACE FMATO-1 system since the loudness is mostly controlled by the talker's distance from the microphone. All self-wired listeners receive their own speech at a higher level because of the proximity of the microphone.

The SPACE FMATO and FMHAO devices are useful for listening to television and radio in private residences, retirement homes, hospital rooms,

and other settings in which there are also normally hearing listeners. The advantage over SPACE HO devices is that the listener is not confined by a wire connected to the television or radio. FM devices and SPACE HO-2, one of the hardwire options, are helpful in clinical situations to provide effective interpersonal communication for members of the health care team with clients. One of the most important applications is for the clergy when they need to communicate with hearing-impaired patients who are seriously ill or who are dying.

SPACE FMATO devices can be used by persons who are not good candidates for hearing aids or who cannot afford the additional cost of the hearing aid as in SPACE FMHAO devices.

The FM devices with their transmission range of 300 feet are excellent for out-of-doors communication. They also are helpful in an automobile and around a dining or conference table when used with a windscreen. They provide quality communication when plugged into the public address system. If this is not possible, placing the FM microphone within range of the talker(s) will, under most conditions, provide a good signal. These arrangements would be appropriate for churches, educators, and presenters at conferences.

ALTERNATIVE HEALTH CARE DELIVERY SYSTEMS

Most traditional audiological health care delivery systems are facility centered rather than client centered. Traditional client-clinician contacts are face-to-face, a type of health care delivery that can cause a loss of clients from the system because of travel barriers. Some of these barriers relate to the expense, time, effort, lack of transportation by clients, inclement weather, and client health complications. These barriers to travel often interfere with, and may make impossible, the frequency, intensity, continuity, and long-term attendance essential to quality care. TEL-Communicology addresses itself to providing supplementary treatment and evaluation for clients who are unserved, underserved, or who live in areas remote from audiology facilities.

TEL-COMMUNICOLOGY (TEL-C)²

TEL-CHECK

Supplementary Treatment. TEL-CHECK consists of supplementary and reinforcement sessions. Daily or weekly contacts are made to review assignments previously given. New material may be attempted and assigned to patients who can benefit from such programs.

Auditory Discrimination Treatment. The auditory discrimination program utilizes talking/listening exercises delivered by speaking into the standard

²The section on TEL-Communicology is largely excerpted from the Remote Machine-Assisted Treatment and Evaluation (REMATE) Annual Report, 1981.

telephone or using telephonically coupled equipment such as teletypewriters, telewriters, and VisiComs. A simple auditory discrimination program may consist of the following:

Clinician/Client	Stimulus/Response
Clinician typed/written/spoken stimulus:	chair bed car
Clinician spoken stimulus:	"sleep in it"
Client typed/written/spoken response:	"bed"
Clinician typed/written/spoken stimulus:	coat boat goat
Clinician spoken stimulus:	"boat"
Client typed/written/spoken response:	"boat"
Clinician typed/written/spoken stimulus:	dog day doll
Clinician spells stimulus:	"d - o - g"
Client response:	"dog"

Audiologists are developing new materials for hearing-impaired clients. Many rehabilitation programs can be supplemented and enhanced by utilizing the TEL-C delivery system.

Speech Maintenance. The telephone provides opportunities to help persons with impaired hearing to retain former speech patterns. Telephone answering equipment is useful in allowing persons in the speech maintenance program to practice by telephone. Clinicians review the tape the following day.

Relaxation Training Program (RTP). The Relaxation Training Program at the Birmingham Veterans Administration Medical Center is based on the program developed by Dr. Eugene Gray of Bay Pines, Florida. The program consists of three stages of relaxation training using EMG and thermal bio-feedback. The RTP is being used presently in tinnitus management and voice treatment. This relaxation program can be successfully continued by telephone after the initial training is provided face-to-face. TEL-CHECK provides the opportunity to determine the level at which each client is maintaining his relaxation protocol.

TEL-RECORD

Auto-Prompting Drill. TEL-RECORD offers auto-prompting drill material for clients who telephone the answering service at the clinician's office. The client's responses are then available for listening at times convenient to the clinician. Hearing aid users can also report any problems with their amplification devices.

During a TEL-RECORD session, the client calls the clinician's office at a scheduled time. The answering system responds automatically and presents the client with taped materials prerecorded by the clinician. Only one tape can be played at a time; therefore, only those clients using a specific tape can call in after hours. Proper scheduling of the various taped programs permits

clients to use TEL-RECORD during office hours, evenings, and weekends. In addition, the clinician can initiate calls to clients during office hours. This telephonic procedure extends a clinician's reach to remote clients while simultaneously providing face-to-face sessions with other clients in the office. When utilizing the answering machine for supplementary treatment, the client who has difficulty in responding immediately over the telephone can tap on the mouthpiece to prevent the answering device from keying up.

TEL-TALK

Client Education. TEL-TALK provides an opportunity for the client to discuss with the clinician any problems related to her/his communicative disorder. Other members of the health team can be alerted when necessary. TEL-TALK is often combined with TEL-CHAT (family education).

The clinicians often are told by clients about additional health problems that need to be reported to Medical Service, Otology, Optometry, Social Work, Dentistry, and others. Clinicians can assist clients who miss appointments and require assistance in arranging new ones.

TEL-TALK allows clinicians to help clients who need information relative to hearing aid problems, noisy environments, and alternative listening devices. Clients who report that their hearing has changed since their last audiological evaluation may be given appointments for otological and audiological examinations.

Listener/Talker Responsibilities. TEL-TALK and TEL-CHAT offer an opportunity to provide clients and their associates with the concepts of listener/talker responsibilities. Turek (1981) states:

A hearing impaired individual is both a talker and a listener in most communication situations. When he is speaking, he has a responsibility to make his message clear to the listener just as he expects a talker to make his message clear to him when he is the listener. As a talker, his responsibilities are to:

1. enunciate clearly—not mumble
2. use the proper tone of voice and inflection
3. watch his listener closely
4. refrain from monopolizing the conversation
5. speak at an understandable rate

The rights as a talker are closely related to the responsibilities of a listener: For example, he has the right to be listened to (heard), therefore, the listener should give the talker his full attention and should:

1. watch the talker closely looking for expression, gestures, etc.
2. concentrate on the message being sent and not let his mind wander, and

3. give feedback as to what he has heard, checking the message after the message has been sent, not interrupting (pp. 61-62).

Organizations of Hearing-Impaired Persons. TEL-TALK and TEL-CHAT also provide opportunities to inform clients and their families and friends of the newly formed groups of hearing-impaired persons. Three of these are: (a) Shhh—Self Help for the Hard of Hearing; (b) COHI—the Consumers Organization for the Hearing Impaired; and (c) the Suzanne Pathy SPEAK-UP Institute.

TEL-CHAT

Family Education. TEL-CHAT offers the clinician a chance to become involved with members of the family. Questions can be answered, information given, and emotional support conveyed to those closest to the client. TEL-CHAT educational activities for family members are similar to those for clients.

Telephone Strategies. Suggestions for telephone strategies to be used in talking over the telephone with hearing-impaired persons may be discussed. Castle (1978) proposed the following strategies:

1. *To be used by people communicating by telephone with hearing-impaired persons:*

Strategy	Explanation
Repeat	Say it again.
Rephrase	Say it again in a different way.
Spell	Say each letter in the word.
Code Words	Use a familiar word that starts with the letter spelled.
Digits	Say each number in the series individually.
Alphabet	Say the alphabet until you reach the correct letter.
Counting	Say the numbers in order until you reach the correct one.
Key Word	Spell the important word in the sentence.

2. *To be used by people with very limited hearing; use any of the four different codes in response to a question:*
 - a. Voice reply of "no, yes-yes, please repeat"
 - b. Tapping a specific number of times on the telephone mouthpiece
 - c. Blowing air a specified number of times into the telephone mouthpiece
 - d. Asking the person to hang up and then call back allowing a specified number of rings.

TEL-RAP

Client Interchange. TEL-RAP allows two or more clients to have a group meeting by telephone. These sessions can be especially helpful to clients who live alone or to those who have little contact with others. The person who has

recently become hearing impaired can be encouraged and given helpful hints by the old-timers.

Using the telephone, teletypewriters, and VisiCom, clients with hearing impairments can discuss mutual problems. These TEL-C contacts can provide support for clients and families who are facing listening/talking problems. Not only can pertinent information be provided, but experienced clients can assist other clients in the audiologic rehabilitation program to cope with the impact of their hearing losses relative to personal/social, educational, vocational, and recreational activities.

TEL-CHECK-UP

Interim Evaluation. TEL-CHECK-UP provides interim evaluation procedures. Progress is assessed, programs are changed, or assignments of additional tasks are clarified during these sessions.

At intervals of *two weeks*, patients are followed by a TEL-C call. The follow-up questions are the same as those given under TEL-SURVEY. If hearing aid users report listening/talking problems at the time of the TEL-CHECK-UP call, they are rescheduled for an appointment at the Audiology Service. When the clients report for their appointments, the alternative and companion SPACE devices are discussed. For clients who do not appear to benefit from a traditional aid, or those who only want amplification for specific environments such as television, automobile, or meetings, information is furnished concerning alternative and companion listening devices, and a SPACE device is loaned. TEL-CHECK-UP is essential to the monitoring of the progress of hearing-impaired patients who reside at a distance from audiology services.

TEL-RE-CHECK

Follow-up. TEL-RE-CHECK offers the opportunity to keep contact with the client who has received TEL-C and/or traditional services. If indicated, arrangements can be made for the client's re-entry into the treatment program.

Hearing Aid Follow-up. The Hearing Aid Follow-up Program—TEL-RE-CHECK, is carried out approximately *six months* after the patient has received the traditional aural rehabilitation program. The aim of TEL-RE-CHECK is to identify any problems the patient may be experiencing. The TEL-SURVEY questionnaire developed for the *annual* follow-up call is also used in TEL-RE-CHECK. The client may describe any problems with the traditional hearing aid related to care and maintenance of the aid or to problems with noisy environments.

Cued Speech. TEL-RE-CHECK also provides the opportunity for confirming the progress in Cued Speech for both talker and listener. Cornett (1967) developed Cued Speech for use with children with severe hearing

impairments. Since Cued Speech provides hand cues for speech sounds that are difficult to speechread, some adventitiously hearing-impaired adults may find this a useful strategy for improving their speechreading.

TEL-SURVEY (Annual Speech, Language, and Hearing Aid Survey)

Hearing Aid Survey. TEL-SURVEY provides *annual* follow-up of clients with speech, language, and hearing problems in order to identify any changes in communication levels, problems with the devices and their use, or additional health needs.

The survey alerts the audiology staff to special needs of patients. Referrals are made to other services such as Audiology, Otology, Optometry, Dentistry, Social Work, and others. TEL-SURVEY serves clients on an annual basis; the other TEL-C procedures serve clients while they are actively in the audiologic rehabilitation program.

TEL-STAFF

Interfacility Case Staffing. TEL-STAFF permits interfacility sharing of clinical information. Interdisciplinary staffing becomes easily available and accessible. TEL-STAFF also assists in moving clients freely from one facility to another without losing continuity of treatment.

Audiologists at other treatment and rehabilitation facilities are alerted concerning the transfer of hearing-impaired patients. This helps insure continuity of care. TEL-C is very useful for coordination between satellite and regional hearing aid centers.

TEL-CONSULT

Consultation. An inexpensive way to provide three-way conference calls involving client, clinician, and consultant or supervisor is to provide add-on capability to the clinician's telephone. In this way, the consultant can listen to the patient and can, at that time or later, make suggestions for further evaluation and treatment of the specific problem.

This TEL-C procedure is helpful in designing programs for clients with severe and unusual communicative disorders, and it also can serve as a part of supervision by those clinicians responsible for student training and the clinical fellowship year.

TEL-ED

Continuing Education. TEL-ED permits inter-facility continuing education and in-service training with client demonstrations. The discussion of special techniques may be combined with the demonstration and evaluation of client performance. An opportunity for an exchange of multidisciplinary information is afforded.

TEL-ED provides opportunities for client and family demonstrations and

professional education. This aspect helps to overcome travel barriers and to extend the program to a greater number of persons interested in TEL-Communicology activities.

TEL-USE

Equipment Training. TEL-USE allows the clinician to monitor any problems in the utilization of devices and to instruct the persons sending or receiving telephonic communication in the optimal utilization of their equipment. Clinicians can often teach the use of SPACE devices by telephone when there is no one in the remote community familiar with the equipment and when the persons cannot come to the facility for instruction.

The use of VisiCom is also taught by TEL-USE procedures. VisiCom is a new aid for persons with hearing, speech, and language impairments who need assistance in communicating by telephone. It is lightweight (eleven ounces), pocket-sized, rechargeable, and battery-powered. The VisiCom displays the information transmitted over telephone lines on an LED read-out. The information originates from standard Touchtone® telephones or from portable Touchtone® pads acoustically coupled to the mouthpieces of dial telephones. Teaching of programming for and utilization of existing TEL-C programs through TEL-ED is essential to sharing information concerning this health care delivery system.

The VisiCom is used by hearing-impaired persons who are able to speak well enough to be understood over the telephone or by speech-impaired persons who have good hearing. Persons who have both hearing and/or speech impairments can communicate with one another if both have VisiComs and some type of Touchtone® capability. VisiComs are commercially available.

REMOTE MACHINE-ASSISTED TREATMENT AND EVALUATION (REMATE)

In combination with traditional face-to-face treatment and TEL-Communicology, REMATE is able to provide *nationwide* supplemental drill sessions for persons with hearing, speech, and language impairments. REMATE can speak, write, type, and Touchtone® to clients and can record the clients' responses in the same modes. Since REMATE can evaluate both Touchtone® and typed responses, the capability for research into long-term treatment programs for various types of communication disorders becomes available.

SUMMARY

The development of alternative listening devices, telephonic delivery systems, and satisfactory listening/talking environments can assist most

hearing-impaired persons to function successfully within mainstream activities of their normally hearing family members and associates. Interpersonal communication is essential to optimal personal, social, educational, vocational, and recreational/cultural participation. The quality of life for hearing-impaired and normally hearing persons depends greatly upon their ability to communicate effectively in the all-pervasive noise of modern environments.

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