

Role of an Audiologist



Introduction

- a) An audiologist is a health-care professional specializing in identifying, diagnosing, treating and monitoring disorders of the auditory and vestibular system portions of the ear.
- b) Audiologists are trained to diagnose, manage and/or treat hearing or balance problems.
- c) They dispense hearing aids and recommend and map cochlear implants.
- d) They counsel families through a new diagnosis of hearing loss in infants, and help teach coping and compensation skills to late-deafened adults.
- e) They also help design and implement personal and industrial hearing safety programs, newborn hearing screening programs, school hearing screening programs, and provide special fitting ear plugs and other hearing protection devices to help prevent hearing loss.
- f) In addition, many audiologists work as auditory scientists in a research capacity.

Audiologists have training in anatomy and physiology, hearing aids, cochlear implants, electrophysiology, acoustics, psychophysics, neurology, counselling and sign language.

Role of an Audiologist in detail

- a) In a Hospital
- b) In a Neonatal and a Paediatric setup-
- c) In a Neonatal and paediatric setup or in nursing homes an audiologist helps to identify and diagnose hearing impairment and possible speech delay soon after the birth of the infant.
- d) In such set up an audiologist closely works with the gynaecologist, the paediatrician and the NICU and PICU staff.
- e) Within the neonatal period the audiologist can identify and diagnose the possible hearing impairment.
- f) This would help in providing early intervention to the infant and thus improving the quality of life.
- g) The mothers are counselled about the handicapping effects of the conditions and motivated for the intervention

program. In addition to this, the audiologist can even counsel the parents of a high risk infant to monitor the possibilities of speech and language development delay.

h) With the improvement in the technology an infant can be screened soon after birth with the help of behaviour observation audiometry, Crib- O - Grams, with the help of a hand held audiometer designed specifically for the paediatrics and neonates, and also with the help of ABR and OAE screeners.

i) In the absence of such equipment, use of simple instruments such as noise makers can indicate the loss but for detailed assessment the parents can be referred to a set up where it can be diagnosed in depth

j) When the child grows old, usually when the child is not responding to sounds and is not speaking age appropriately, the parents usually come to the paediatricians for help, then the paediatrician is of maximum help to the parents as he or she would refer them to the audiologist.

k) In a neurological set up

l) The main focus of audiologist in neurological setup is differentially diagnosed cochlear versus retrocochlear disorder.

m) So the audiologist has to be familiar with the symptoms and clinical manifestations of the disorders encountered.

n) An audiologist helps in identifying and diagnosing hearing loss caused due to a neurological disorder such as auditory neuropathy, central auditory processing disorders, Neoplasm and tumors, Brainstem encephalitis, Epilepsy, Demyelinating diseases, Hydrocephalus, Meningitis, Viral infections, Cerebrovascular disease, Cerebral palsy, Attention deficit hyperactive disorder (ADHD), Hyperacusis, Tinnitus, Parkinson's disease, Meniere's disease, Vestibular disorders.

Instrumentation for hearing assessment in a neurological setup would include:

- a) Diagnostic audiometer
- b) Immittance audiometry with reflexometry
- c) Evoked potential Audiometry

- d) Otoacoustic emission
- e) Vestibular assessment system
- A. Diagnostic audiometer. The audiometer in use has to be a single channel or a dual channel with option to administer:
 - a) Pure tone audiometry
 - b) Speech audiometry
 - c) It also needs to have an option for special test such as
 - i. Tone Decay Test (TDT)
 - ii. Short increment Sensitivity Index (SISI)
 - iii. Supra Threshold Adaptation Test (STAT)
 - d) Tests for Central Auditory Processing Disorder
- B. Immittance audiometry and reflexometry. A diagnostic immittance meter can be used with facility for reflexometry and Reflex Decay Test (RDT).

Otoacoustic Emission Instrument. Otoacoustic emission instrument with facility for

- a) Transient Evoked Otoacoustic Emission.
- b) Distortion Product Otoacoustic Emission and
- c) Contralateral suppression.

C. Evoked potential instrumentation. Clinical applications of Auditory evoked response are - neuro-diagnosis in adults or children, and other is estimation of hearing sensitivity, mostly in children and in difficult to test population.

Presently, ABR has been the most important test in investigation of retrocochlear pathology. Pathology such as space occupying lesions, demyelinating disorders, maturation delay, metabolic causes of coma, monitoring neural function during brain surgery and also correlation of various disorders of higher brain functions. Stacked ABR is an important tool in assessing acoustic tumour than the standard ABR.

The auditory evoked potentials would include:

- a) Electrocochleography.
- b) Auditory Brainstem Response.
- c) Auditory Mid-latency response.
- d) Auditory late latency response.
- e) P300 and MMN response.
- f) Stacked ABR
- g) Vestibular Evoked Myogenic Potentials

Pediatric central auditory processing evaluation

- a) Target population. Children aged 4-18 years with

normal hearing ($PTA \leq 20$ dB HL), but reported difficulty understanding speech in the classroom and other situations, and those at-risk for academic problems due to suspected auditory processing problems.

b) Rationale. Identification and categorization of central auditory processing problems can allow proper referral to appropriate special education resources, initiation of aura rehabilitation therapy, and provision of assistive listening devices. Counseling parents and teachers regarding results can prevent criticism of the child for poor listening behavior by promoting understanding of the cause of listening problems. When neurologic problems are suspected, referral can be made to pediatric neurology / neuropsychology.

c) Equipment required

- i. Clinical audiometer.
- ii. CD player.
- iii. Parent and teachers questionnaires.
- iv. Recorded speech materials and manuals for central auditory assessment.

The instrument used in a neurological setup needs have facilities to conduct these tests to arrive at diagnosis.

Apart from clinical testing in a neurological setup, the audiologist also has a role in monitoring neural function during brain surgery, assessment of balance system and monitoring facial nerve.

Intra-operative Auditory Monitoring

d) Target population. Patients undergoing surgery that place the auditory system at risk and those undergoing procedures for the relief of endolymphatic hydrops. These include hearing preservation procedures for removal of acoustic neuromas, vestibular nerve section, nerve decompression procedures, and endolymphatic procedures.

e) Rationale. In the procedure that places the auditory system at risk; intraoperative auditory monitoring provides feedback to the surgeon regarding the status of the auditory function that can be useful in preserving hearing. In endolymphatic sac procedures for the patients with abnormal electrocochleography recording, intraoperative monitoring may be useful for detecting changes in cochlear function. Intraoperative auditory monitoring is performed by measuring the compound action potential (AP), summing potential (SP), and the auditory brainstem response (ABR).

f) Equipment required. Evoked potential equipment

- i. Transtympanic needle electrodes (12 mm or 75 mm

stainless steel electrodes)

ii. Shielded insert earphones (ER-3A)

iii. Facial Nerve Electroneurography

g) Target population. Patients who have suffered acute facial paralysis as a result of idiopathic (Bell's Palsy), trauma, herpes zoster oticus, viral infections such as chicken pox and mumps, or otologic infections. In general the evaluation should occur no sooner than 48-72 hours and no later than 21 days after the paralysis onset.

h) Rationale. Facial nerve electroneurography (ENOG) attempts to determine the quantity of electrically stimuable nerve fibers remaining on the side of the paralysis. This is done by comparing the amplitudes of the responses recorded from each side of the face.

i) Equipment required. Evoked potential system with somatosensory stimulation capability.

i. Surface electrodes.

ii. Somatosensory probe.

1.3 Vestibular Function tests: Electronystagmography and Rotation

a) Target population:

i. Patients who have symptoms of vertigo, disequilibrium, or imbalance due to an underlying disease condition. This might involve inner ear (Meniere's syndrome and labyrinthitis), the vestibular nerve (acoustic neuroma), cervical muscle and vertebrae, or the central nervous system (e.g. basilar artery migraine, demyelinating disease such as multiple sclerosis, neurodegenerative diseases, tumors and infarcts).

ii. Patients who are receiving medications that might impair inner ear function. Ototoxic drugs include the aminoglycoside antibiotics and some diuretics when they are used in conjunction with other ototoxic medication.

iii. Patients who are recovering from inner ear or vestibular nerve surgery and continue to have symptoms of vertigo and disequilibrium. The surgery might have been resection of an acoustic neuroma or a vestibular nerve section for intractable Meniere's disease.

b) Rationale. The term electronystagmography has been used for the set of tests including the following:

a. Caloric stimulation

b. Screening test for saccades

c. Pursuit eye tracking

d. Optokinetic stimulation

e. Evaluation of the spontaneous eye movements during maintained eye positions and

f. Hallpike Maneuver.

The ENG and rotation test battery can identify a vestibular deficit affecting eye movements and the vestibular-ocular reflex (VOR) and determine whether there is a bilateral deficit or an asymmetry due to decreased function (or increased) on one side compared to the other side. In addition, it is useful for determining whether there is an oculomotor deficit which might involve central nervous system pathways in common with the vestibular system.

Equipment required

i. EOG electrodes.

ii. Visual stimulus generator.

iii. Caloric irrigation unit.

iv. Computer driven rotation chair.

Vestibular Function tests: Dynamic Posturography (DP)

a. Target population

1) Patients complaining of vertigo, disequilibrium, or imbalance.

2) Patients who are being followed to determine whether there is a progression of a disease state that affects the balance mechanisms or to differentiate among several subtypes of the disease condition.

3) Patient undergoing balance training or physical therapy.

4) Patients who are being evaluated for balance problems after head trauma.

b. Rationale. The term posturography refers to the quantitative measurement of the body sway or center of force exerted at the feet while the patient stands on a platform. Dynamic refers to measurements taken while the platform is moving as well as it is stationary. Only body movement in the forward/backward plane will be considered. Since the DP evaluates the vestibule-spinal system and the function of vertical semicircular canals and Otolith organs, it complements the ENG and rotation test.

Dynamic Posturography provides unique information that can help identify whether postural instability is due to a deficit to use sensory information from the inner ear, eye, or the cutaneous receptors of the feet and the proprioceptors of the joints and muscles of the leg, or the combination of different sensory modalities. There might be a pattern of responses across the different DP test conditions that would suggest a specific disease condition. However, DP itself does not provide site of lesion, or laterality information.

c. Equipment required.

i. Equitest platform with visual surround.

- ii. Computerized data acquisition and display system that is integrated with the platform controller and force transducers.
- iii. Safety harness.
- iv. Genetics

Sometimes Audiologists are the first professionals to identify hearing loss caused by genetic transmission and syndromes that are likely to have hearing loss.

The audiologists refers their clients to the genetics' for a complete genetic test and gene analysis

In the ENT set up

Audiologists and otorhinolaryngologists should go hand in hand for the best available medical care and treatment for hearing disorders. They complement each other in the assessment, diagnosis and treatment of ear and throat disorders. Audiologists are an integral part of an ENT practice.

- d. Audiological practice in an ENT setup should,
 - i. Help in diagnosing conductive hearing loss
 - ii. Help in diagnosing sensorineural hearing loss
 - iii. Hearing evaluation for patients with tinnitus and vertigo
 - iv. Help in monitoring the benefit after surgical intervention
 - v. Help in monitoring the success of drug therapy
 - vi. Help in determining the appropriate treatment plans
 - vii. Help in determining the candidacy for surgeries like cochlear implantation
 - viii. Postsurgical intervention after cochlear implantation, tympanoplasty etc.
 - ix. Treatment of hearing loss with hearing aids which cannot be treated with any other medical techniques.
 - x. They identify pseudohypacusis

A. Rehabilitation

Audiologists have an important role in the rehabilitation of persons with ear disorders. An audiologist should be able to manage patients with both hearing and vestibular problems. The different rehabilitative processes which an audiologist is involved in and ENT setup are,

- i. Identification and evaluation of sensory capabilities
- ii. Interpretation of results
- iii. Counseling

iv. Intervention for communication

a) Monitoring the progress of treatment: Pre and post-operative monitoring of hearing has its importance in the rehabilitation of individuals with conductive hearing loss. Also before and after drug therapy, the hearing should be evaluated for proper and accurate rehabilitation for individuals with conductive and sensorineural hearing loss. The stream of treatment could be determined on the basis of the test results. Ototoxicity can also be monitored with the help of hearing assessment. An audiologist should be able to assess the benefit of various treatment techniques.

b) Rehabilitation with hearing aids: For individuals with hearing loss which cannot be treated with medical approaches, hearing aids can be helpful. Audiologists should help the patient in prescribing suitable hearing aids and to get adjusted with it. Further rehabilitation with hearing aids should also be provided by audiologists.

c) Rehabilitation with cochlear implants: For individuals who cannot benefit from medical techniques and hearing aids, cochlear implantation can be done. Audiologists determine the candidacy for the technique, and post surgical interventions are also done.

d) Rehabilitation of individuals with tinnitus: Audiologists help individuals with tinnitus with different techniques like tinnitus retraining therapy, counseling etc. They should also be able to explain various mechanisms underlying tinnitus.

e) Rehabilitation and assessment of individuals with vertigo: Different evaluations are done for individuals with vertigo and also the treatment stream is also aided with the hearing evaluation. Diagnosis and treatment of disorders like Menier's Disease are mainly dependent upon the hearing evaluation results.

f) Auditory verbal therapy: Audiologists play a very important role in the therapeutical management of those fitted with hearing aids and cochlear implants. Especially in cases with children, auditory verbal therapy is very helpful and proves the best available option of treatment. Auditory training may help in case of adults.

g) Rehabilitation of individuals with APD: Audiologists help in the diagnosis and treatment of auditory processing disorders. Different treatment approaches are undertaken by audiologists depending upon the specific auditory processing deficit.

h) Counseling: audiologists should be able to counsel the patient,

i. Teach the patient to adopt right attitude towards his

handicap

- ii. Importance of hearing aid
- iii. Importance of therapy
- iv. Educate the parent and patient regarding the hearing loss and set realistic expectations for the ability of hearing instrument to assist in better communication
- v. Outline the patient's responsibilities in the use of hearing instruments and adjustment of hearing instruments in a variety of environments
- vi. All patients who are prescribed hearing aids should be counseled regarding the use, care and maintenance of hearing aids of moulds.
- vii. Psychologists and psychiatrists
- viii. Audiologists identify diagnose and treat hearing problem that are of psychological origin.
- ix. In a Smile train clinic
- x. Audiologist identifies, diagnose and treat children and adult hearing complaints in case of cleft lip and palate as they are susceptible to conductive hearing loss.
- xi. Apart from the above mentioned set up, an audiologist is trained to treat hearing difficulties in the geriatric population
- xii. They are trained to diagnose, and extract information from the radiological reports.
- xiii. Audiologist in a Military set up
- xiv. Audiologists in the military set up are primarily recruited for the Hearing conservation Programme.
- xv. Conduct the full spectrum of diagnostics, including audiologic and vestibular evaluation, electrophysiology and hearing aid and cochlear implant services.
- xvi. Provide education, training, clinical support and program management.
- xvii. Engage in research- based practice as well as training and supervision of technicians, students and resident physicians.
- xviii. An Air force Audiologist helps manage and develop hearing conservation programs as the personnels would be working in extreme noise conditions inherent with working around jets can cause hearing damage
- xix. Audiologist also helps in measuring noise levels at the runway and within the Air force station. They also provide HCP for those personnels working with the Aircraft machinery.
- xx. They also assess hearing and balance mechanism at the time of recruitment.
- xxi. They take care of the hearing of the personnel's families and those living within the Air Force Station.
- xxii. They Serve as the Hearing Conservation Program Manager for aviation, shipboard and artillery communities.
- xxiii. Perform auditory examinations on service personnel, their families and those in need across the globe.
- xxiv. Supervise, lead or conduct audiological research, whether measuring the auditory effects of humans not wearing proper ear protection or the long-term effects of sound on marine mammals.
- xxv. Provide hearing conservation certification for technical personnel so they know exactly how to protect their hearing
- xxvi. Perform routine and advanced auditory examinations.
- xxvii. Note any possible changes in hearing and instruct people on how to properly protect themselves from noise exposure.
- xxviii. Diagnose, evaluate and assess the impact of hearing loss on communication.
- xxix. Enhance communication ability through aural rehabilitative support.
- xxx. Ensure the auditory combat readiness of Fleet and Marine personnel.
- xxxi. Serve as consultant manager of Navy/Marine Corps Hearing Conservation Programs, demonstrating how crews' earplugs are inserted correctly and ensuring that cranial/earmuffs fit well and are in good condition.
- xxxii. Audiologist in an industrial set up
- xxxiii. Selecting suitable test areas for noise survey and audiometric tests
- xxxiv. Getting audiometric tests done
- xxxv. To formulate, administer and update the HCP
- xxxvi. Guidance and management on purchase of equipments or machinery related to industrial setup.
- xxxvii. Training and supervising the workers in proper use of EPDs
- xxxviii. Maintaining the effective records pertaining to HCPs
- xxxix. Participating in the selection of noise control procedures

xl. Decision to be made for the noise survey which includes industrial audiologists and acoustical engineer

xli. Noise reduction should be handled by an acoustical engineer at various levels (source, transmission and listener).

xlii. The acoustical engineer plays important role in first two aspects while audiologist plays major role for noise control at the listener level

xliii. Education of employee and the employer should be done regarding the noise survey and noise control procedure

xliv. Education should include information on hearing aspects, effect of noise, HCP, EPDs, selection of EPDs, audiometric evaluation, consequences of hearing loss and difficulty in communication related to hearing impairment.

xlv. The areas of noise hazards should be clearly marked and the employers working in these areas should be educated about the harmful effects of noise exposure.

i) Noise survey:

The main purposes of noise survey are

- a) To determine the risk area
- b) Level of attenuation required
- c) Audiologists or acoustical engineers making the noise survey should include details about the frequency composition, noise level and duration of noise exposure in these areas
- d) The impairment of speech communication that occurs during excessive noise exposure should be taken into consideration
- e) If the noise level can't be in order to restrict below Damage Risk Criteria (DRC) then the role of EPDs should be given emphasis for the employers or workers
 - i. Audiologist in a school setting
 - ii. In a school setting an audiologist Ideally, the educational audiologist should have primary responsibility for the identification of preschool and school age children with hearing loss and/or middle ear disease.
 - iii. The educational audiologist should coordinate the screening program.
 - iv. They help in setting up of classroom amplification system and also help in the seating arrangement for the children in a classroom.
 - v. The audiologist identifies CAPD, monitors children with speech and language delay caused by hearing impairment.

vi. One responsibility of the educational audiologist is to ensure that the hearing impaired child makes maximum use of this residual hearing.

vii. By integrating diagnostic information from speech and language assessments, the educational audiologist can determine a child's current level of performance and the rate at which communicative skills are being acquired

viii. The audiologist plays a most important role in audiologic management of the hearing impaired child.

ix. The responsibilities in audiologic management include selection and evaluation of amplification, amplification maintenance, monitoring class-room noise, provision of habilitative activities, and parent counseling.

x. The educational audiologist must make sure that the characteristics of both the personal and classroom hearing aids of a child are comparable.

xi. The audiologist should provide the teacher and principal with a list of suggestions for classroom noise reduction.

xii. Auditory training, speech and language training, or visual communication training and may be provided by the educational audiologist.

xiii. The role of the educational audiologist is to coordinate these habilitative services and to interact with the child's teacher regarding specific areas in need of work or special concerns.

xiv. The audiologist's input should be evident in the individual education program (IEP) as it relates to such audiologic information as specific amplification needs, the amount and type of language and speech interventions required, the acoustic environment, parent and child counseling, and support systems for the classroom teacher.

xv. Audiologists who are employed by or contract with schools have unique opportunity to influence good classroom acoustics in their district or service area.

Major areas of responsibility for the audiologist include:

- a) Advocacy
- b) Information resource
- c) Performing observations and acoustical measurements in classroom and other learning spaces
- d) Collaborating with the educational facility planning teams
- e) Ensuring access for the special population
- f) Conducting efficacy measurements to determine the need for and benefits from acoustical treatments and

modifications

g) These areas of the activity are not necessarily the independent activities and may currently be within the work scope of some educational audiologists. For instance, advocacy and information resource functions are essentially pervasive across all areas of responsibility related to classroom acoustics.

h) The audiologist can provide useful information to facility planning and management teams, but it is collaborate with other professionals, and the skill set of an acoustical consultant or engineer also may be required.

i) This is often the case when there is above the - ceiling plenum noise that needs to be managed using acoustic blankets or other available acoustical treatments. The audiologist can play a unique role in the promotion and marketing of good classroom acoustics.

j) Collaborating with the other professionals will be more productive than launching a solo personal campaign to influence the change.

k) Audiologist, architect, engineer, acoustical consultant and other members of social facility planning teams each offer a specific knowledge and skill set that will contribute to improving the classroom acoustics are perhaps the audiologist's greatest resource to be used to ensure acoustic access to information in the learning environment.

l) The audiologist clearly not to provide long term support in resolving personal conflicts, which may manifest themselves as guilt or depression. Rather, counselling for the audiologist means helping client's find ways to make practical adjustments in these situations to meet specific concerns. When science of guilt and depression are present, referral to a psychologist or other medical professional is appropriate.

m) As non professional counsellors, one of our roles is to guide students through the acceptance stage of the grieving process, where we can promote an important component: a healthy self concept.

n) The social emotional aspects of hearing loss are critical to consider for students in the schools with hearing loss. Just as we ensure optimal listening and learning for students with hearing loss.

o) Audiologist working with children in educational settings need to be aware of evaluating all aspects of how a student functions and these components are inter related, not just the audiogram.

In a rural set up

i. Audiologists provide audiological (aural) rehabilitation to children and adults across the entire age

span.

ii. Audiologists select, fit and dispense amplification systems such as hearing aids and related devices.

iii. Audiologists prevent hearing loss through the provision and fitting of hearing and consumer education.

iv. Audiologists are involved in auditory and related research pertinent to the prevention, identification and management of hearing loss, tinnitus and balance system dysfunction.

v. Audiologists serve as expert witnesses in litigation related to their areas of expertise.

vi. Audiologists provide services in private practice in medical settings such as hospitals and physician's offices; community hearing and speech centres; managed care systems; industry; the military; home health, subacute rehabilitation, long term care and intermediate care facilities; and school systems.

vii. Audiologists provide academic education in universities to students and practitioners in audiology, to medical and surgical students and residents and to other related professionals. Such education pertains to the identification, assessment and nonmedical management of auditory, balance and related disorders.

viii. Activities that identify, assess, diagnose, manage and interpret test results related to disorders of human hearing, balance and other neural systems.

ix. In Forensic sciences and medico-legal cases

x. Determining (investigating) the cause/effect features of hearing impairment claims.

Consulting activities such as

a) Evaluating the audibility of warning signals in collision cases;

b) rating the efficacy of a hearing conservation program;

c) measuring community noise sources;

d) assessing product failure or misuse in product liability actions;

e) malpractice actions; and

f) Proactive efforts such as consultation on product development to reduce potential noise hazards.

The legal issues in which an Audiologist plays important role are:

a) Workers Compensation (NIHL, AT).

b) Administrative Law (Environmental Noise)

c) Constitutional Law (OSHA).

- d) Tort Law (injury, death, product liability).
 - e) Criminal Matters (audibility, intelligibility).
 - f) Professional Negligence (malpractice).
- B. In a cochlear implant company
- a) An Audiologist visits various hospitals on behalf of the company for developing the CI implantation procedures and for its promotions.
 - b) Remote mapping of the implant, intraoperative mapping, performing NRT, Impedance testing and ART
 - c) Inferring the radiological reports, providing detailed assessment to identify the candidate for the CI.
 - d) Research and development of test materials exclusively for assessing cochlear implantees.
 - e) Provide rehabilitative support and develop various rehabilitative strategies and spread its information among special educators, teachers, Auditory verbal therapists.
 - f) Discussing with the surgeon regarding the choice of implantation in terms of its electrode array.
 - g) Providing pre- operative counselling and post-operative counselling, training clinical audiologists to map the implant and its timely fine tuning.
 - h) Trouble shooting of the device
 - i) An audiologist works either as a clinical audiologist or works for special projects or research to provide evidence based practice.
 - j) In a hearing aid company
 - k) Assess the performance of a hearing aid
 - l) Performs electro acoustic measures.
 - m) Helps in marketing of the hearing aids and expands professional community.
 - n) It is the responsibility of the audiologist to take the time to perform, interpret and utilize the required tests for diagnostic and amplification and fitting purposes.
 - o) It is the responsibility of the audiologist to remain 'current' via reading the professional literature, studying, attending courses, earning CEUs and similar activities.

Maintaining competency and expertise regarding technology is the responsibility of the professional.

It is the responsibility of the audiologist to discuss, explore and demonstrate Assistive Listening Devices (ALDs) with every patient. ALDs aren't highly profitable when sold and they take a large amount of time to discuss, explore and demonstrate. Yet, ALDs can often make or break a patient's ability to function in a given environment. The satisfaction of

knowing patients are communicating well is worth the extra time and effort.

It is the audiologist who offers the best value will garnish the greatest market share. Some manufacturing costs can be reduced (or eliminated) by highly skilled audiologists who are able to modify instruments in their office. Additionally, audiologists can help reduce or eliminate costs by taking consistently excellent ear impressions, picking flexible circuits, and packaging ear impressions carefully. The audiologist and the manufacturer, together, must take responsibility for the ultimate price of the instruments.

- a) As a private practitioner
 - b) An audiologist who is in private practice manages a clinical set up fully.
 - c) Identifies diagnoses and manages hearing impairment.
 - d) Provides fitting of appropriate hearing instrument, prepares ear mold, dispenses hearing aids to the clients directly
 - e) Manages professional communication with hearing aid and companies dealing with the diagnostic instruments.
 - f) Promotes himself/herself in the market to gain referrals of the client.
 - g) In urban areas
- C. Prevention

Prevention of hearing loss primarily considered at 3 levels.

a. Primary prevention: Aims to eliminate/ inhibition of the onset and development of the problem. Several activities considered for the same are:

i. To educate general public on various causes of HI, aiming to prevent the occurrence of the problem.(open day / science day programs).

ii. The target group that has been provided such services includes:

b. Medical professionals: pediatrics, ENT doctors, family physicians, PHC doctors, Post graduate medical doctors.

c. Paramedical professionals: Nurses and CBR workers. Head of schools, school teachers, social and health workers, anganwadi workers and different philanthropic organizations.

During these interactive programs the groups get guidelines on prevention, identification and management of the HI individuals. They are also given pamphlets and posters regarding prevention of HI. These orientation programs promote ear care and hearing conservation.

d. Secondary prevention: Involves screening to identify individuals suspected to have hearing problems. This is done in order to identify, further diagnose and rehabilitate early screening is considered with respect to different target groups:

- i. Newborn babies
- ii. School aged children
- iii. Adults - NIHL
- iv. Geriatrics - Presbycusis.

Screening is done by a team of specialist which includes an Audiologist and an ENT specialist.

Screening is usually recommended for:

- i. Newborn babies: To identify at risk infants for HL as early as possible, because this is the critical age for speech and language development.
- ii. School aged children: To identify any acquired / late onset hearing loss. To detect the presence of ME infection and to educate parents / educators about its future consequences (counseling). Also to promote early identification and rehabilitation of these children to prevent from deterioration of acquired speech.
- iii. Noise induced hearing loss: This is one of the preventable causes for hearing loss. Through hearing conservation program the industrial employers are being educated regarding the ill effects of noise on hearing but also about the ill effects on the physical and mental health by conducting various workshop and orientation programs.
- iv. Follow up programs to monitor the noise effects
- v. Orientation programs to the employees on use of ear protective devices
- vi. Orientation programs for elderly individuals:
 - a) Do's and don'ts about the hearing loss.
 - b) Systemic diseases and its contribution to hearing loss.
- vii. Camps.
 - a. Tertiary prevention: Involves rehabilitation of individuals identified as having HI. In young children it is required to help them acquire speech and language.
 - b. In individuals with acquired HL: Hearing is necessary to monitor his / her speech. HI will also affect an individual's education and job placement.
 - c. Providing guidance: medical /surgical /Audiological management.

The impact of these hearing conservation problem helps

to detect individuals with milder problems with unilateral hearing loss.

Identification and Assessment

This includes activities that identify dysfunction in hearing , balance and other auditory related problems.

- i. Supervision, implementation and follow up of newborn and school hearing screening programs.
- ii. Identification of population s and individuals with or at risk for HL and other auditory dysfunction , balance impairments, tinnitus and associated communication impairments as well as of those with normal hearing.
 - a. Assessment:
 - iii. Interpretation of behavioral, Electroacoustic and or electrophysiological methods to assess hearing, auditory function, balance and related systems.
 - iv. Intra operative monitoring and indirect assessment of cranial nerve functioning using electrophysiological tests.
 - v. Evaluation and management of children and adults with auditory related processing disorders.
 - vi. Performance of otoscopy for appropriate Audiological management or to provide a basis for medical referral.
 - vii. Tinnitus assessment.
 - viii. Assessment for other conditions such as auditory neuropathy, acoustic tumors, genetic HL, HL with familial history.
 - ix. Assessment of certain syndromic hearing loss
 - x. Assessment and differential diagnosis of various ME conditions and several pathologies resulting in cochlear neural HL
 - xi. Preparation of a report including interpretation of data, summarizing findings, generating recommendations and developing therapy and management plans.
 - xii. Referrals to other professionals, agenesis / organizations.
 - xiii. Evaluation of HIV and other infectious patients, separate sterilizable audiometric rooms to be considered.
 - xiv. Research: Psychoacoustics lab, genetics lab, research lab to study the neurobiology of the cochlea, Lab to study the concepts of digital engineering.
 - xv. Evaluation of medico legal clients.
 - xvi. Audiologist as an expert witness.
 - b. Rehabilitation
 - a) Responsibilities include:

- i. Hearing aid optimization and selection
- ii. Hearing aid check
- iii. Reprogramming and periodic checks
- iv. Repair and maintenance
- v. Selection and counseling for ALD's
- vi. Use of compensatory strategies
- vii. Candidacy and selection for CI
- viii. Post implant and preimplant counseling
- ix. NRT

Mapping and rehabilitation

- b) Counseling: Different types and degree of hearing impairment.

Different kinds of management option such as medical and Audiological management

a. Training

- i. Tinnitus management
- ii. Auditory training
- iii. AVT
- iv. CAPD management.
- c. Extension Services

Camps: As a part of welfare activity conducting camps will provide facilities for,

- i. Screening /diagnosis
- ii. Counseling
- iii. Prescribing medicines
- iv. Distribution of hearing aids
- v. Issuing certificates
- vi. Taking ear mold impression.
- i. Development of public education materials/HRR/ test modules to train grass root workers.
- ii. Conducting noise surveys & promoting hearing conservation to prevent NIHL.
- iii. Develop national epidemiological databases and follow-up programs for communication disorders.
- iv. Provide information about the privileges, rights and sanctions existing for individuals with hearing impairment.

Distance learning programs

Telediagnosis and Telerehabilitation

- i. Audiologist as nonprofessional counsellor

ii. An audiologist cannot provide long term support in resolving personal conflicts, which may manifest themselves as guilt or depression. Rather, counselling for the audiologist means helping client's find ways to make practical adjustments in these situations to meet specific concerns. When signs of guilt and depression are present, referral to a psychologist or other medical personal is appropriate.

a) As a non professional counsellors, one of our roles is to guide students through the acceptance stage of the grieving process, where we can promote an important component: a healthy self concept.

b) The social emotional aspects of hearing loss are critical to consider for students in the schools with hearing loss. Just as we ensure optimal listening and learning for students with hearing loss.

c) Audiologist working with children in educational settings need to be aware of evaluating all aspects of how a student functions and these components are inter related, not just the audiogram.

d) An audiogram is only a small part of one's profile. Too often, audiologist immediately confirms what type of technology and accommodations are needed for a student solely from an audiogram.

e) Frequently the recommendations are rejected by the clients because the time or consideration to involve the client in the discussion implications of hearing loss and the social, economical aspects of the hearing loss has been over looked.

f) One of the important aspect of consideration in fitting Hearing Assistive Technology is social and emotional adjustment. The audiologist and support team must consider motivation, attention, fatigue, self image, self advocacy, social acceptance, classroom culture and family support to achieve a successful outcomes with HAT.

Future Directions

a) Educational audiologists provide comprehensive services to support students with hearing loss and/or auditory processing difficulties in their learning environments.

b) As an increasing percentage of these students receive their instruction in general education settings, school systems and educational audiologists will need to become more flexible in the way that support services are provided and funded.

c) Additional resources and creative strategies to support and train general education teachers will need to be developed. While the professional practices outlined above are based on current mandates and reimbursement

within special education legislation, student access to instruction in all environments together with educational outcomes will remain paramount in ensuring future services and professional practices [1-7].

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