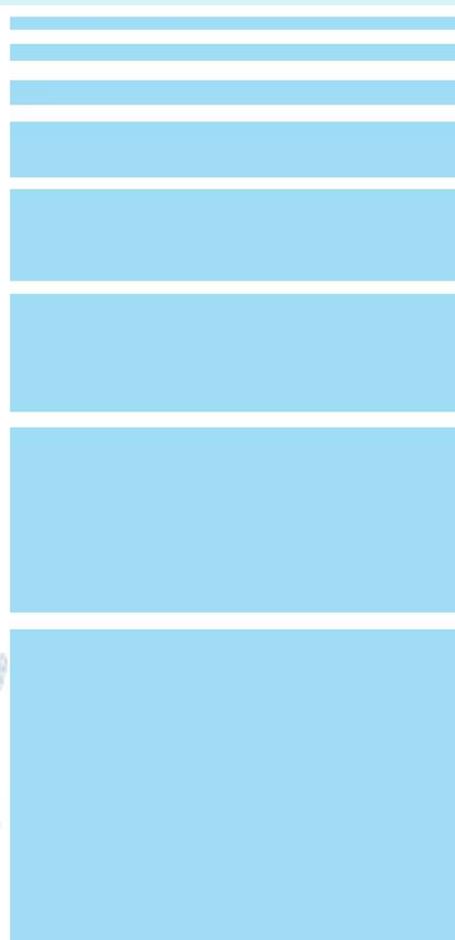
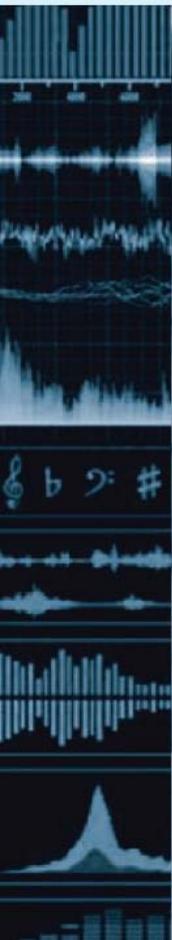




MINISTRY OF HEALTH MALAYSIA

MOH/P/JOH/06.12 (GU)

# GUIDELINE FOR HEARING AID PRESCRIPTION AND FITTING



MEDICAL DEVELOPMENT DIVISION

2012



MEDICAL DEVELOPMENT DIVISION  
MINISTRY OF HEALTH MALAYSIA



**GUIDELINE FOR HEARING AID  
PRESCRIPTION AND FITTING**



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## LIST OF ABBREVIATIONS

AC	: air conduction
AGC	: automatic gain control
BC	: bone conduction
BTE	: behind the ear
CROS	: contralateral routing of signals (CROS)
DAI	: direct audio input
dB	: decibel
dBHL	: dB hearing level
dB SPL	: dB sound pressure level
ERA	: evoked response audiometry
FM	: frequency modulation
HA	: hearing aid
IEC	: International Electrotechnical Commission
ISO	: International Organization for Standardization
ITE	: In-the-ear
ITC	: In-the-canal
mA	: mili-amperes
MAIS	: meaningful auditory integration scale
MPO	: maximum power output
OAE	: oto-acoustic emission
OSPL	: output sound pressure level
REM	: real-ear measurement
REAR	: real-ear aided response
RESR	: real-ear saturation response
REIR	: real-ear insertion response
SPL	: sound pressure level

## **FOREWORD by HEAD of AUDIOLOGY PROFESSION**

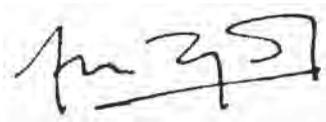
I would like to express my gratitude to the committee who have put together an effort to come up with the update of the hearing aid guideline which previously had been published in September 2007. I would also like to extend my appreciation to our colleagues in Universiti Kebangsaan Malaysia (UKM) for taking their time in helping us in the final revision of this book. This guideline, along with other Audiology guidelines is intended to help audiologists in the government service to be more focused and dedicated to improve Audiology services to patients.

Patients come in with various needs and problems. With the vast and numerous kind of technology nowadays, almost all patients can be helped with hearing aids and other types of assistive listening devices, regardless of the degree and type of hearing loss. Alongside the process, audiologist needs to take into consideration of patient's or parents' feedback regarding hearing aid use.

Audiologist needs to apply “client-centered approach” instead of “clinician-centered approach” when dealing with patients or parents with hearing-impaired children. It is our task to give our expert opinion and guidance for patient who is a candidate for hearing aids, but the decision is finally lies with them. Audiologist also needs to keep in mind the cost of each hearing aid prescribed and other socio-economic factors involved.

that is not been thoroughly explained in this guideline is the art of counseling. Even though it was not discussed in this book, audiologist needs to be sensitive and adept at listening to patients. Wisdom dictates that we use caution, skill, and a

Finally, I hope that audiologists will keep this guideline as their daily reference and manual for ensuring the best possible outcome to patients.



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October 2012

## 1.0 INTRODUCTION

Amplification and hearing aid fitting is a part of audiologist's scope of practice, which is routinely done in a busy clinical setting. It involves hearing aid selection, fitting, verification and validation, and rehabilitation process. Throughout the procedure, there will be times when audiologist needs a reference as to when to fit and who will benefit from certain or special types of hearing aids, how to conduct hearing aid verification and validation process and also choices of rehabilitation program to be selected.

Earlier edition of this book (2007) has guided audiologist and hearing aid dispensers exclusively on the types of hearing aid and the price limit of hearing aids for each patient, who apply financial help from the governing institutions (e.g. Public Service Department (JPA), Tabung Bantuan Perubatan (TBP) MOH, Pusat Zakat, etc.).

This new version of Guideline for Hearing Aid Prescription and Fitting will guide the readers more on the selection of hearing aid, verification and validation process and includes new section on rehabilitation for adult and children population. This book is solely for audiologists practicing in the government hospitals, to help them starting from the process of selecting hearing aids towards the procedure for hearing aid verification and validation. It is hoped that this guideline will help audiologist in selecting the most suitable hearing aids for each patient they see in their clinic.

This new version of hearing aid guideline has been updated with recent issues and reviews from several international guidelines and selected articles regarding hearing aids. This guideline will be updated from time to time to suit the need of rapidly evolving hearing aid technology and the changing need of patient's auditory disorder.

## **2.0 POPULATION : CHILDREN**

### **2.1 QUALIFICATION FOR HEARING AID SERVICES**

- Professionals qualified for pediatric hearing aid service must be an Audiologist, who has a minimum of Bachelor's degree in Audiology from an accredited Audiology program.
- Experience in assessment and management of infant and children with hearing loss is needed for an Audiologist to provide the service.
- Equipments : Audiologist must have the necessary test equipment to complete all testing procedure for hearing aid selection, verification and validation (Standard Operating Procedure (SOP) for Hearing-Impaired Pediatric Patient Care).
- Referrals should be made if the Audiologist does not have adequate experience and equipments necessary to evaluate and provide pediatric hearing aid services.
- Medical clearance : Any infant and children diagnosed with any type and degree of

hearing loss should be referred to Otorhinolaryngology (ORL) Specialist for medical clearance prior to hearing aid fitting.

## **2.2 AUDIOLOGICAL ASSESSMENT PROTOCOL**

- Recommended test battery is divided into four developmental age groups:
  - i. 0 to 7 months :
    - Comprehensive case history,
    - Parent/caregiver observation report, other professional report,
    - Antenatal/postnatal, otologic history
    - Otoscope examination,
    - Acoustic immittance with 1000 Hz,
    - Behavioral observation audiometry (BOA)/Visual Reinforcement Audiometry,
    - Click and Tone Burst (500 and 4000 Hz) Auditory Brainstem Response (ABR) by air and bone conduction,

and/or Auditory Steady State Response (ASSR),

- Otoacoustic emission – distortion product and/or transient evoked
- Real Ear-to-Coupler Difference (RECD) measured or age-appropriate predicted before hearing aid selection.

ii. >7 to 30 months :

- Case history,
- Parent/caregiver observation report, other professional report,
- Antenatal/postnatal, otologic history,
- Speech-language and development history,
- Otoscopic examination,
- Acoustic immitance with 226 Hz and diagnostic acoustic reflex at 1000Hz,

- Air and bone conduction Visual Reinforcement Audiometry,
  - Click and Tone Burst (500 and 4000 Hz) Auditory Brainstem Response (ABR) by air and bone conduction, and/or Auditory Steady State Response (ASSR) if reliable individual ear results cannot be obtained,
  - Otoacoustic emission – distortion product and/or transient evoked,
  - Real Ear-to-Coupler Difference (RECD) measured or age-appropriate predicted before hearing aid selection.
- iii. 30 months to 6 years :
- Case history,
  - Parent/caregiver observation report, other professional report,
  - Antenatal/postnatal, otologic history,
  - Speech-language and development history,

- Otoscopic examination
- Acoustic immittance with 226 Hz and diagnostic acoustic reflex at 1000Hz,
- Air and bone conduction Visual Reinforcement Audiometry or Play Audiometry
- Click and Tone Burst (500 and 4000 Hz) Auditory Brainstem Response (ABR) by air and bone conduction, and/or Auditory Steady State Response (ASSR) if reliable individual ear results cannot be obtained,
- Otoacoustic emission – distortion product and/or transient evoked,
- Real Ear-to-Coupler Difference (RECD) measured or age-appropriate predicted before hearing aid selection.

iv. 6 years and above :

- Case history,
- Parent/caregiver observation report, other professional report,

- Identifying information purpose of referral,
- Communication history,
- Audiological history,
- Otologic and medical history,
- School performance report,
- Otoscope examination,
- Acoustic immittance with 226 Hz and diagnostic acoustic reflexes,
- Air and bone conduction Pure Tone Audiometry,
- Uncomfortable listening level (UCL) when indicated,
- Speech awareness and recognition test,
- Otoacoustic emission – distortion product and/or transient evoked test,

- Click and Tone Burst (500 and 4000 Hz) Auditory Brainstem Response (ABR) by air and bone conduction, and/or Auditory Steady State Response (ASSR) if reliable individual ear results cannot be obtained.

### **2.3 CRITERIA FOR CANDIDACY OF AMPLIFICATION**

- The criteria for pediatric amplification is in accordance with WHO definition of disabling hearing impairment :

“Disabling hearing impairment in children under the age of 15 years should be defined as a permanent unaided hearing threshold level for the better ear of 31 dB or greater; for this purpose the “hearing threshold level” is to be taken as the better ear average hearing threshold level for the four frequencies 0.5, 1, 2 and 4 kHz.”  
(WHO, 2009)

- In addition, amplification should be considered for a child/infant diagnosed with a permanent, bilateral hearing loss of >35 dBHL by behavioural testing or 30 dBnHL by click ABR threshold in the better ear.

- Amplification should be considered for a child who has a hearing impairment lesser than 31 dBHL, but showing significant impairment in speech and language acquisition.
  
- The decision for amplification should be based on :
  - o Child's audiological data
  
  - o Speech and language development
  
  - o Home and/or educational environment
  
  - o Family preference
  
  - o Existence of other medical condition or special needs.
  
- Timeliness:
  - o Infants with confirmed hearing loss before 3 months old should receive amplification by 6 months old.
  
  - o For infant and children with permanent, bilateral hearing loss of >30 dBHL, the hearing aid should be fitted within 1 month of diagnosis.

- o It is recommended that infant and children with binaural hearing loss be fitted with a loan hearing aid if they are waiting financial aid to purchase hearing aids.

## **2.4 SELECTION OF HEARING AIDS**

### **2.4.1 TYPES OF AMPLIFICATION**

#### **2.4.1.1 NON-ELECTROACOUSTICS FEATURES**

- Routing of Signal :
  - o Binaural hearing aid fitting : All hearing aid fittings for bilateral hearing loss should be binaural unless there is evidence, over time, of no benefit in one ear.
  - o Implantable devices should be recommended with careful decision and after thorough discussion with the ORL Specialist.
- Behind the ear (BTE) hearing aids are the preferred choice for most children.

- Custom-made hearing aids cannot be recommended for use with infants and young children (less than 5 years old) due to the small size and potential growth of outer ear.
- Bone conduction hearing aids should be prescribed if the hearing loss is conductive and the ear is anatomically not suitable for BTEs.
- Body-worn aids should only be prescribed if BTEs could not be fitted due to medical or physical contraindications.
- FM Systems is considered for children who required optimal hearing in variety of listening environments and/or at greater distances. Teacher and parents' feedback must be discussed thoroughly before the decision for FM System is made.

- Ear mould requirements :
  - o Should be made from soft, non-allergic material (except for cases where there is a need for special ear mould, e.g skeleton ear mould).
  
  - o Should be replaced whenever feedback is present or when there is a retention problem. Retention problem can be avoided by using 'huggies', two sided tapes and headbands.

### 2.4.1.2 ELECTROACOUSTICS FEATURES

Minimum Performance Requirements	
Peak OSPL90 (dBSPL)	118 dB (+/- 4dB)
HFA OSPL90 (dBSPL)	114 dB (+/- 4 dB)
Maximum full-on gain	45 – 55 dB (+5/-0 dB)
Full-on gain at 1 kHz	42 dB (+5/-0 dB)
Basic frequency response	200 Hz to 4500 Hz (200 Hz to 2000 Hz +/- 4dB, 2000 Hz to 4000 Hz +/- 6 dB, on nominal frequency response curve)
Total harmonic distortion at 70 dBSPL input	500 Hz <10% 800 Hz <10% 1600 Hz <5%
Equivalent input noise level at 50 dB input	<35 dBSPL
Battery current	< 1 mA

### 2.4.1.3 ADDITIONAL FEATURES

Features	Minimum Features Recommended
Channel	Multichannel
Microphone	Allows dual – Omni and Directional microphone
Bandwidth	Wide dynamic range
Signal Processing Schemes	<ul style="list-style-type: none"> <li>• Digital signal processing and has option for linear and non-linear signal processing.</li> <li>• Automatic feedback management</li> </ul>
Memories	Multiple memories
Ability to couple to Assistive Listening Devices	Has DAI and Telecoil built-in

#### 2.4.2 SPECIAL CONSIDERATION

- For unilateral hearing loss cases:
  - o In view of exorbitant cost of the device, consideration for amplification is based on hearing aid trial session which should prove the benefit of amplification for the patient. Amplification options for this population includes CROS hearing aids and FM System.
  
  - o For severe to profound sensorineural hearing loss cases : Referrals to the National Cochlea Implant Team should be made.
  
- Auditory neuropathy cases : Hearing aid fitting is advised to be delayed until behavioural audiometry results were reliably obtained. It is also advised that the gain and MPO setting of hearing aid is minimally set to avoid over-amplification. Cochlea implant is considered if the hearing loss is already moderate to profound.

- Infants and children with chronic middle ear conditions should be referred for medical treatment; however, fitting of amplification and referral for early intervention should not be delayed while waiting for resolution.
- Infants/children who experience a long hospital stay and fulfilled the criteria for amplification, should be fitted with appropriate hearing instruments after medical clearance.

#### 2.4.3 AMPLIFICATION SAFETY FEATURES

- It is recommended to use tamper-resistant battery doors for children.
- It is advisable to use volume control cover or disabling the volume control via programming software.
- Use of pediatric hook is advisable for pediatric hearing aid fitting.

#### 2.4.4 MAINTENANCE KIT/ACCESSORIES

- It is recommended that all hearing aids for children is inclusive of all these kit :
  - o Dry aid kit
  - o Battery tester
  - o Listening tube/stethoclip
  - o Extra batteries
  - o Blower
  - o Additional pre-bent tubing

### **2.5 HEARING AID VERIFICATION**

- **Quality control**

It is necessary to test the electroacoustic characteristics according to the IEC Standard of Hearing Aids, IEC 60118-0. Hearing aids. Part 0: Measurement of electroacoustical characteristics.
- Listening check must be performed every time during hearing aid evaluation, to check for excessive electrical noise and intermittency.

- Physical comfort of ear mould
  - o The aim is to assess the comfort of ear mould when coupled to the ear, to check for absence of feedback, to ensure ease of insertion and removal of ear mould, and to make sure it is securely fit.
  
- Performance of the hearing aid
  - o Probe microphone measurement or REM is performed to verify the frequency-gain and output of the hearing aid, which is based on the Desired Sensation Level input/output formula (DSL i/o) or NAL prescriptive.
  
  - o This should be performed using a hearing aid test box and the hearing aid's setting is adjusted to ensure the target for soft speech, conversational speech and loud sounds is met.
  
  - o It is suggested to use a speech-like signal for soft and medium input level which is a broadband sound with long-term spectrum and temporal modulations of typical speech (Cox, 2009). It is also recommended to use REAR measurement in pediatric hearing

aid verification procedure, and especially if the patient's hearing aid is using NAL-NL1 formula (BSA and BAA, 2007).

- o Otoscope examination must always be performed prior to REM procedure and take into consideration for any abnormality of the ear canal condition such as earwax, perforated tympanic membrane, grommet, mastoid cavity, or ear discharge (BSA and BAA, 2007).
- o Before verifying the function of the hearing aids, the directional microphone function, compression system and any other advanced features of the hearing aid must first be checked and switched-off.
- o Measure the length of the ear mould's canal.
- o Check the option of binaural hearing aid fitting or conductive hearing loss correction factor.

- o Run an RESR curve to check and match the MPO setting of the hearing aid at 90 dB SPL (using warble tone). Subsequently, run REIR curve on different input levels (soft and medium input level) to ensure that the outputs are comparable with the target, with recommended tolerances : +/- 5 dB at 250 Hz, 500, 1000 and 2000 Hz, and +/- 8 dB at 3000 and 4000 Hz (Hostler et. al., 2009).
  
- o Switch on the advanced features of the hearing aid before fitting the hearing aid back to the patient. Verify the tolerance of the patient towards loud sounds by introducing loud /bah/ sound or any other narrow band noise with different frequency band (using cymbal, clapping hands or rattle). Adjust hearing aid setting accordingly.
  
- o Aided sound field responses/aided audiograms should also be performed, however the result would only gives information on how well the hearing aid responds to very soft sounds, not on how loud the hearing aid is for a child or any

other condition which would affect the hearing aid condition, such as distortion.

## **2.6 VALIDATION OF AMPLIFICATION**

- Questionnaires
  - o Questionnaires like MAIS and MUSS are recommended to be used with infant and children with hearing aids.
  - o Parental observation report should also be taken into consideration.
- Auditory performance test – EARS is to be performed within several months during hearing aid follow-up procedure.
- Other assessments that can be administered :
  - o IT MAIS - For children aged 6 months to 3 years old,
  - o COSI-C
  - o CHILD ((Children Home Inventory of Listening Difficulties)
  - o APHAB-C

- o Hearing Performance Inventory for Children – For children aged 8 -14 years old.

## **2.7 COUNSELING AND FOLLOW-UP**

### **2.7.1 HEARING AID ORIENTATION**

Hearing aid orientation and training should include the child, family members, and caregivers. Clinician should advise them about the devices, combined explanation, demonstration, and hands on. Parents should be taught on the practice and handling of the hearing aids. The suggested procedure for hearing aid orientation includes :

- a. care of the hearing aids, including cleaning ear mould and moisture, suggested wearing schedule and retention problem.
  
- b. insertion and removal of hearing aid (family members are given an opportunity to practice inserting and removing the hearing aid).

- c. overnight storage, with or without the dry-aid-kit (including the mechanism for turning off the hearing aids)
- d. insertion and removal of batteries. Parent should be strongly advised about several aspects related to the safety of their child (e.g. battery ingestion). It is recommended that hearing aid prescribed for infants and toddlers includes an option for tamper-resistant battery drawer.
- e. Information for battery life, storage, disposal and toxicity. Parents should be advised that hearing aid batteries are not rechargeable and need to be changed timely. Information on basic troubleshooting (weak batteries, feedback, plugged ear mould and or receiver) should also be administered.
- f. Information on telephone coupling and use, assistive device coupling and use.

g. Demonstration for the use of other accessories of hearing aid maintenance and care (e.g., battery tester, listening stethoscope and ear mould blower)

h. The need for follow-up appointments to monitor use and effectiveness. A return appointment should be scheduled three to four weeks following the initial hearing instrument fitting.

- Special note: when one hearing aid is in need of repair, clinics need to maintain a supply of loan hearing aids, so that children will have consistent use of binaural amplification.

#### 2.7.2 EARLY INTERVENTION AND SPEECH THERAPY

- All infants and children should be enrolled in an Early Intervention Program and be referred to Speech Therapist as soon as they are identified with hearing loss.

- For children who rejected hearing aids, referral to Occupational Therapist should be made when necessary (e.g. for behavior modification and management of sensory integration).

### 2.7.3 AUDIOLOGICAL RE-EVALUATION AND FOLLOW-UP

It is advisable to follow-up on infant or children every 2 weeks or on a monthly basis before the hearing aid setting is stable and meet targets. However, below is the general guide on the frequency of audiological follow up for these population :

- Infant and children should be seen at least every three (3) months during the first two (2) years, and
- Every three (3) to six (6) months after the first two (2) years.

## **3.0 POPULATION: ADULTS**

### **3.0 QUALIFICATION FOR HEARING AID SERVICES**

- Personnel: Qualified Audiologist – who has a minimum of Bachelor’s Degree in Audiology from an accredited Audiology program (Standard Operating Procedure for Care of Hearing Impaired Adults)
  
- Facilities should at least include:
  - o A set up for comprehensive hearing assessment (otoscope, tympanometer, diagnostic audiometer and sound treated room).
  
  - o Hearing instrument selection process (hearing instrument specification, programming software and hearing aid demonstration set).
  
  - o Hearing instrument fitting and verification equipment.
  
  - o Hearing instrument validation system.

### **3.1 AUDIOLOGICAL ASSESSMENT PROTOCOL**

- A complete case history that should include:
  - Personal information
  - Sociological background (employment and social activities)
  - Psychological background (cognitive, motivation, attitude towards hearing aids)
  - Medical history (health status, tinnitus, vertigo, ear disease)
  - Physical status including dexterity and vision ability
  - Communication abilities (speech perception in quiet and noise)
  - Otoscopic examination.
- Audiological assessment should consist of Pure Tone air and bone conduction thresholds (may include Uncomfortable Level, UCL) to determine the type, degree and diagnosis of hearing loss.

- Other tests e.g. Speech Test that may contribute to determination of HA candidacy and also to the success of hearing aid fitting.
- Counseling.
- Outcome measures to determine the need for audiologic rehabilitation (e.g. Hearing Handicap Inventory for the Elderly (HHIE), Hearing Handicap Inventory for Adult (HHIA), Client Oriented Scale Improvement (COSI), Abbreviated Profile of Hearing Aids Benefit (APHAB), Glasgow Hearing Aid Benefit Profile (GHABP)
- Medical referral to and/or clearance from Otorhinolaryngology team in cases such as ear diseases, tinnitus, vertigo etc.

### **3.2 CRITERIA FOR CANDIDACY OF AMPLIFICATION**

- Hearing instruments candidacy should be based on patient's auditory and non-auditory needs. There are several factors of adults' hearing aids candidacy:

#### a) Audiological Factors

- Patients with abnormal audiometric results (more than 25 dBHL at least at 3 frequencies average) should be considered for amplification.
- Audiometry results (severity, type and configuration of hearing loss) will contribute to the determination of amplification.
- Speech tests should also be performed in assessing level of hearing handicap and benefit of amplification.

- Patient who showed improvement in speech intelligibility during hearing aid trial should be highly considered as a hearing aid candidate.
- Patient with poor speech test scores, regardless the degree of hearing loss should also be considered as a hearing aid candidate, but counseling on realistic expectations of hearing aid use should be administered clearly.

b) Psychological factors

- Motivational factors are often influenced by the degree of hearing handicap. Individuals who are highly motivated will likely to perform well with hearing aids.
- The extent of patient's disability from assessment tool (e.g. COSI, APHAB and GHABP) will suggest better prognosis in hearing amplification.

- It is also recommended to evaluate patient's realistic expectation for hearing aid using Expected Consequences of Hearing Aid Ownership (ECHO) questionnaire.

c) Other factors

- Manual dexterity and visual ability will influence the type of hearing instrument selection. A patient with poor manual dexterity and vision ability may need help from family members to achieve a successful hearing aid use.

### **3.3 SELECTION OF HEARING AIDS**

#### **3.3.1 TYPES OF AMPLIFICATION**

##### **3.3.1.1 ELECTROACOUSTICS FEATURES**

- The following features should be suitable with patient's hearing status and comply with IEC standards (see appendix):
  - Gain

- MPO
- Frequency response
- Input output function
- Distortion

#### 3.3.1.2 NON-ELECTROACOUSTICS FEATURES

- Hearing aid style
- Binaural or monaural fitting
- Ear mould /shell selection and configuration
- Microphone directionality

#### 3.3.1.3 ADDITIONAL FEATURES (OPTIONAL)

- Telecoil
- Program/memory option
- Compatibility with assistive listening device
- Remote control
- Volume control preference
- Expansion and compression system
- Binaural synchronization
- Feedback manager
- Noise canceller / Reduction

### 3.3.2 SPECIAL CONSIDERATION

#### 3.3.2.1 MEDICAL CLEARANCE

- Medical clearance should be requested for patient with:
  - o Pathology in outer and/or middle ear
  
  - o Sudden onset of sensorineural hearing loss.

#### 3.3.3 MAINTENANCE KIT/ACCESSORIES

A full package of hearing aid maintenance kit should consist of:

- Stethoclip
  
- Battery tester
  
- Air puffer
  
- Hearing aid dehumidifier
  
- Cleaning kit
  
- Extra batteries (for at least 12 months of usage)

- Ear mould cleansing table (optional for BTE style)
- Warranty card (warranty for at least 2 years)
- Magnetic pen for easy handling and insertion of battery

### **3.4 HEARING AID VERIFICATION**

#### **3.4.1 QUALITY ASSESSMENT**

Audiologist should do either one of these quality assessment at least once immediately after hearing aid fitting, i.e.:

- Real Ear Measurement (REM), or
- Sound-field Aided Test, or
- Hearing Aid Test Box (HATB),
- Verification process is done to adjust the hearing aid setting until it produces soft speech, conversational speech and loud sounds that are as close to the targets as possible.

The process is relatively similar to fitting of hearing aids to pediatric population.

- However, it is advisable to check patient's verbal feedback and hearing aid setting must be adjusted according to the patient's report of intolerance or unacceptable description towards the matched hearing aid targets.
- If patient complains that the hearing aid is too loud, reduce the acclimatization level or adaptation level of the hearing aid, without changing the frequency shaping that had been set during REM. If frequency shaping is affected, adjust the hearing aid setting using gain control function.

## **3.5 VALIDATION OF AMPLIFICATION**

### **3.5.1 OUTCOME MEASUREMENT**

Audiologist should do either one of these outcome measurement every six month after hearing aid fitting e.g.

- Hearing Handicap Inventory for the Elderly (HHIE), or
- Hearing Handicap Inventory for Adult (HHIA), or
- Client Oriented Scale Improvement (COSI), or
- Abbreviated Profile of Hearing Aids Benefit (APHAB), or
- Glasgow Hearing Aid Benefit Profile (GHABP)

## **3.6 COUNSELING AND FOLLOW-UP**

**3.6.1 HEARING AID ORIENTATION** (Please refer to Appendix 5.2 : Hearing aid orientation checklist)

## 4.0 OTHER CONFOUNDING ISSUES

### 4.1 Financial aid resources :

4.1.1 Source of financial aid for hearing aid purchasing should be taken into consideration before hearing aid prescriptions were given, either from Public Service Department (JPA), Department of Social Welfare, Tabung Bantuan Perubatan (MOH), Department of Veterans' Affairs (JHEV), Pusat Zakat, etc.

4.1.2 It is set that the price limit for JPA funding of hearing aids is set to RM 3,500 per ear. However, this does not include funding for other assistive listening devices or implantable hearing aids. The application for these devices is depending on careful consideration and decision made from the audiologist in charge and approval from the Ministry of Health, Malaysia.

4.1.3 The price limit for TBP funding of hearing aid is in accordance with the latest protocol set by the Bahagian Tabung Bantuan Perubatan, Ministry

of Health Malaysia. Audiologist can refer to Medical Social Officer in their respective hospitals for further information.

4.2 Protocol for application of hearing aid funding :

4.2.1 Hearing aid selection protocol should be commenced in the Audiology Clinic, and the suggestion of hearing aid use must be made by the Audiologist.

4.2.2 Any application for financial aid (especially for JPA and TBP claim) should be in no consideration if the hearing aid prescription was made by non-government Audiologist.

## **5.0 APPENDICES**

- 5.1 Hearing Handicap Inventory for Adults
- 5.2 Hearing Aid Orientation Checklist
- 5.3 Flow Chart of Referral for Amplification (Adult)
- 5.4 Client Oriented Scale of Improvement
- 5.5 Ear Impression Measurement
- 5.6 Procedure For Verifying Hearing Aid Setting Without Standard Equipment

## APPENDIX 5.1 : Hearing Handicap Inventory for Adults

### HEARING HANDICAP INVENTORY FOR ADULTS

**Instructions: The purpose of the scale is to identify the problems your hearing loss may be causing you.**

**Check Yes, Sometimes, or No for each question.**

**Do not skip a question if you avoid a situation because of a hearing problem.**

**Please write N/A if the question does not apply.**

#### **Yes Sometimes No...**

1. Does a hearing problem cause you to use the phone less often than you would like? \_\_\_ \_\_\_ \_\_\_ s
2. Does a hearing problem cause you to feel embarrassed when meeting new people? \_\_\_ \_\_\_ \_\_\_ e
3. Does a hearing problem cause you to avoid groups of people? \_\_\_ \_\_\_ \_\_\_ s
4. Does a hearing problem make you irritable? \_\_\_ \_\_\_ \_\_\_ e
5. Does a hearing problem cause you to feel frustrated when talking to members of your family? \_\_\_ \_\_\_ e
6. Does a hearing problem cause you difficulty when attending a party? \_\_\_ \_\_\_ \_\_\_ s

7. Does a hearing problem cause you difficulty hearing/ understanding co-workers, clients, or customers? \_\_\_ \_\_\_  
\_\_\_ s
8. Do you feel handicapped by a hearing problem? \_\_\_ \_\_\_  
\_\_\_ e
9. Does a hearing problem cause you difficulty when visiting friends, relatives, or neighbors? \_\_\_ \_\_\_ \_ s
10. Does a hearing problem cause you to feel frustrated when talking to co-workers, clients, or customers? \_\_\_ \_\_\_ \_\_\_ e
11. Does a hearing problem cause you difficulty in the movies or theater? \_\_\_ \_\_\_ \_\_\_ s
12. Does a hearing problem cause you to be nervous? \_\_\_ \_\_\_  
\_\_\_ e
13. Does a hearing problem cause you to visit friends, relatives, or neighbors less often than you would like? \_\_\_  
\_\_\_ \_\_\_ s
14. Does a hearing problem cause you to have arguments with family members? \_\_\_ \_\_\_ \_\_\_ e
15. Does a hearing problem cause you difficulty when listening to TV or radio? \_\_\_ \_\_\_ \_\_\_ s

16. Does a hearing problem cause you to go shopping less often than you would like? \_\_\_ \_\_\_ \_\_\_ s
17. Does any problem or difficulty with your hearing upset you at all? \_\_\_ \_\_\_ \_\_\_ e
18. Does a hearing problem cause you to want to be by yourself? \_\_\_ \_\_\_ \_\_\_ e
19. Does a hearing problem cause you to talk to family members less often than you would like? \_\_\_ \_\_\_ \_\_\_ s
20. Do you feel that any difficulty with your hearing limits or hampers your personal or social life? \_\_\_ e
21. Does a hearing problem cause you difficulty when in a restaurant with relatives or friends? \_\_\_ \_\_\_ \_\_\_ s
22. Does a hearing problem cause you to feel depressed? \_\_\_ \_\_\_ \_\_\_ e
23. Does a hearing problem cause you to listen to TV or radio less often than you would like? \_\_\_ \_\_\_ \_\_\_ s
24. Does a hearing problem cause you to feel uncomfortable when talking to friends? \_\_\_ \_\_\_ \_\_\_ e

25. Does a hearing problem cause you to feel left out when you are with a group of people? \_\_\_ \_\_\_ e

**For Clinician's use only: Yes = 4 Sometimes = 2 No = 0**

**Total score for e-questions: \_\_\_ Total score for s-questions:**

\_\_\_\_\_

## APPENDIX 5.2 : Hearing Aid Orientation Checklist

### 1.0 Hearing Aids

- 1.1 Parts of aid and/or mold identified
- 1.2 Insertion and removal of aid/mold demonstrated and explained
- 1.3 Patient attempted/performed insertion and removal
- 1.4 Attachment of mold to aid discussed/demonstrated if BTE
- 1.5 Patient attempted/performed mold detachment and re-attachment
- 1.6 Volume control/remote control manipulation was discussed/demonstrated
- 1.7 Patient attempted/performed V.C or R.C. adjustment
- 1.8 Volume control marked at recommended use setting

### 2.0 Battery

- 2.1 Insertion/removal of battery discussed/demonstrated
- 2.2 Patient attempted/performed insertion/removal of battery
- 2.3 Purchase options for batteries discussed
- 2.4 Type and expected life of batteries discussed
- 2.5 Opening battery door when not in use discussed
- 2.6 Warned of danger of swallowing batteries

### **3.0 Care and Maintenance**

- 3.1 Moisture and temperature problems discussed,   
how to avoid and how to remedy (perspiration, humidity, rain – Dry-Aid Kit)
- 3.2 Instructions for use of Dry-Aid kit given
- 3.3 How to avoid trauma to aid (dropping, heat/cold)   
and other dangers discussed
- 3.4 Other things that can damage aid (hair spray,   
dirty/greasy hands) discussed
- 3.5 Cleaning aid/mold discussed or demonstrated   
(tissue, tools, air blower)

### **4.0 Adjustment/Listening Tips**

- 4.1 Programs described
- 4.2 Binaural hearing and balance, if applicable,   
described
- 4.3 Stage managing the situation described
- 4.4 Instructional brochures for individual hearing aid   
reviewed
- 4.5 Telephone usage tips given
- 4.6 Feedback causes, remedies discussed

### **5.0 Follow-Up**

- 5.1 Warranty coverage and length explained (extension   
purchase option if needed)
- 5.2 Life expectancy of an aid explained
- 5.3 Appointment assigned for next visit, name of   
clinician and phone number of clinic given in case  
of problems

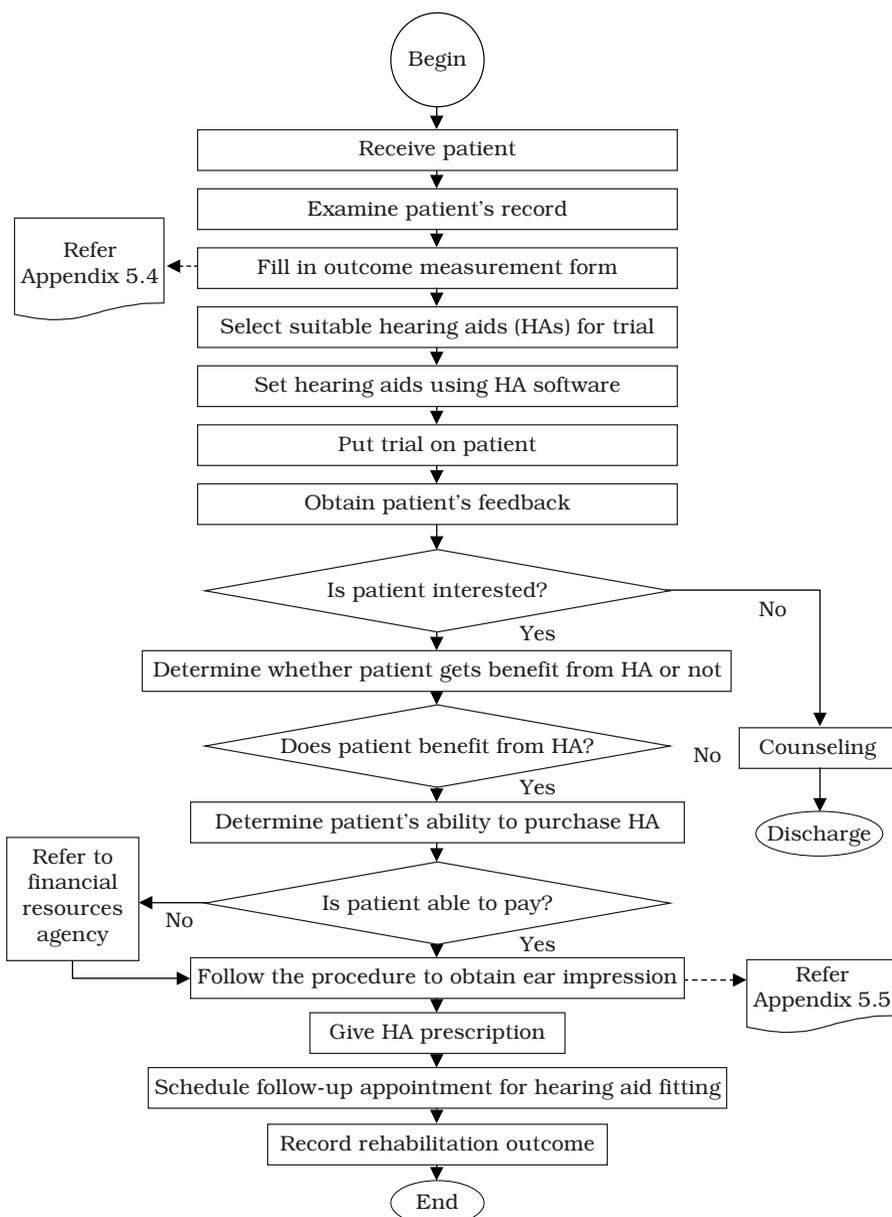
5.4 Patient counseled about realistic expectations   
for hearing aid performance. Tell the patient that  
they can realistically expect : some degree of  
visibility (from any style of hearing aid); physical  
comfort; improved, but not perfect, communication;  
and more benefit in quiet than in noise.

\*I, \_\_\_\_\_,  
I/C No. : \_\_\_\_\_ hereby  
acknowledge the explanation given by the audiologist and  
understand all the above information.

Date : \_\_\_\_\_ Signature \_\_\_\_\_

Adapted from The University of Memphis Speech and Hearing  
Center Guidelines for Provision of Amplification for Adults

**APPENDIX 5.3 : Flowchart of Referral for Amplification  
(adapted from SOP for Care of Adult Patient)**



## Appendix 5.4

### CLIENT ORIENTED SCALE OF IMPROVEMENT

Name: \_\_\_\_\_ Category: New \_\_\_\_\_ Degree of change \_\_\_\_\_ Final ability(with hearing aid)  
 Audiologist: \_\_\_\_\_ Return \_\_\_\_\_ Person can hear \_\_\_\_\_  
 Date: 1. Needs established: 10% 25% 50% 75% 95%  
 2. Outcome assessed:

### SPECIFIC NEEDS

Indicate order of significance

	Worse	No Difference	Slightly Better	Better	Much	CATEGORY	Hardly Ever	Occasionally	Half the Time	Most of Time	Almost Always
<input style="width: 40px; height: 25px;" type="text"/>											
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**Categories**

- |   |  |
|---|--|
| 1. Conversation with 1 or 2 in quiet    | 9. Hear front door bell or knock       |
| 2. Conversation with 1 or 2 in noise    | 10. Hear Traffic                       |
| 3. Conversation with group in quiet     | 11. Increased social                   |
| 4. Conversation with group in noise     | 12. Feel embarrassed or stupid contact |
| 5. Television/Radio @ Normal volume     | 13. Feeling left out                   |
| 6. Familiar speaker on phone            | 14. Feeling upset or angry             |
| 7. Unfamiliar speaker on phone          | 15. Church or meeting                  |
| 8. Hearing phone ring from another room | 16. Other                              |

## Appendix 5.5 : Ear Impression Measurement

1. Explain to patient about the procedure to be performed.
2. Perform otoscopic examination.
3. Ear impression measurement should be performed cautiously if patient has ear discharge, impacted earwax, and large mastoid cavity.
4. Choose or modify the otoblock according to the size of patient's ear canal.
5. Insert the otoblock using penlight until it reaches the second bend of the ear canal.
6. Mix the ear impression material and compress it inside the syringe.
7. Push the ear impression material into the ear canal following the ear contour. Do not pull out the pinna during this procedure.
8. When the ear impression is hardened (not too hard), pull out the ear impression slowly.

9. For patient that has the possibility for acoustic feedback, open jaw technique should be applied during the procedure.
10. Determine the need for acoustic modification to the ear mould according to patient's audiogram.
11. The ear impression that has been completed will be sent to the hearing aid manufacturer for ear mould processing.

## **APPENDIX 5.6 : Procedure for verifying hearing aid setting without standard equipments**

The procedure described below is to help audiologist to verify the performance of hearing aids with low-technology and feasible equipments which are easily accessible in the clinic. These procedures are intended to be used in a clinic/ facility which does not have a standard, calibrated hearing aid measurement equipment. **However, audiologists are advised to upgrade their clinic according to the standard. It is also advised to refer patient (especially infants and young children) to other Audiology Clinic which has the standard equipment for verifying hearing aid setting.**

The procedures involved are :

- 1. Verifying amplification for soft sounds**
- 2. Verifying amplification for conversational speech**
- 3. Verifying comfort towards loud sounds**
- 4. Assessing the Directional Microphone function**
- 5. Assessing the Digital Noise Reduction function**

### **1. VERIFYING AMPLIFICATION FOR SOFT SOUNDS**

1.1 Materials needed : SPL-o-gram

1.2 Test environment and equipment : Sound-proof room, audiometer, loudspeaker

1.3 Method of assessment :

1.3.1 Make sure patient is seated facing a standard loudspeaker.

1.3.2 Measure aided sound field thresholds (using warble tones in dB SPL) and plot the response in an SPL-o-gram.

1.3.3 Convert dBHL value into dB SPL (add correction factor according to the frequency tested)

250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
+13	+6	+4	+0.5	-4.5

1.3.4 Draw a line showing the average 1/3 octave band speech spectrum for soft speech (50 dB SPL). (Figure 1.0)

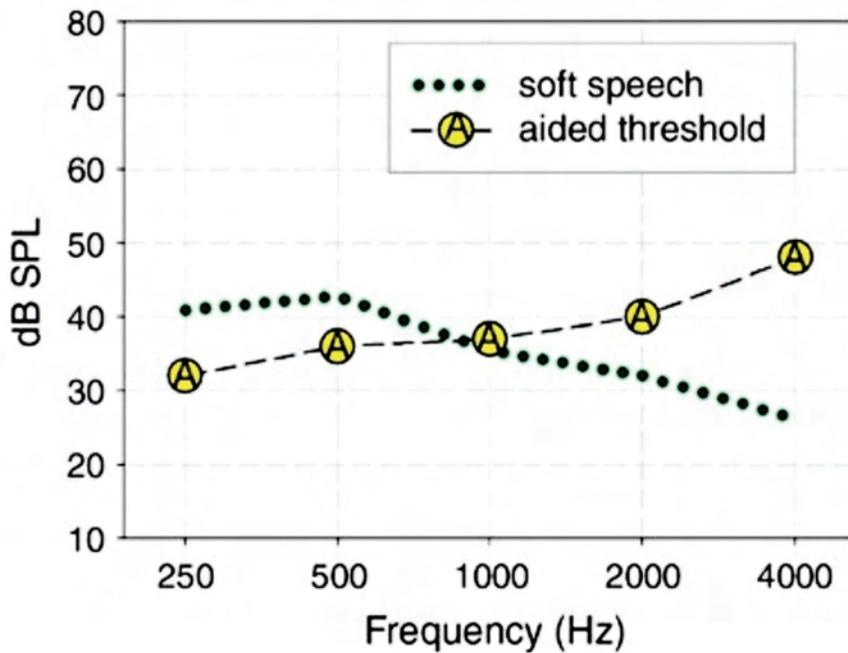


Figure 1.0 : A sample of SPL-o-gram with corrected aided audiogram and soft speech target. Note that the soft speech is more audible at lower frequency than the high frequency.

1.3.5 Another method is using Six-Ling Sound test. Seat the patient at 1 meter distance and introduce /ah/, /ee/, /oo/, /mm/, /sh/ and /ss/, spoken in a soft voice, which is about 30-50 dB level of speech.

1.3.6 Ask the patient to close eyes and repeat after the sounds. Verify whether the patient is able to hear and repeat all sounds.

1.3.7 If the patient's response fails to reach the target, or the patient fails to respond or repeat after any sounds, adjust the hearing aid setting accordingly.

## **2. VERIFYING AMPLIFICATION FOR CONVERSATIONAL SPEECH**

2.1 Materials needed : Own voice, or a CD with continuous speech, a CD player and a sound level meter (SLM) (a standard SLM or an SLM application for iPad, iPhone or android device) and a loudness scale sheet.

2.2 Test environment and equipment : A room typically similar to a living room.

2.3 Method of assessment :

2.3.1 Place a sound level meter (with standard C-weighting and fast response) about 1 meter from the patient's chair.

2.3.2 Adjust the CD volume until the speech level is about 60 dBSPL.

2.3.3 Mark the CD volume.

- 2.3.4 Seat the patient at 1 meter from and facing the loudspeaker.
- 2.3.5 Give the patient a loudness scale chart (Figure 2.0)
- 2.3.6 Make sure the patient's hearing aid is turned on and present the speech.
- 2.3.7 Ask the patient to determine which category best describes the loudness of the speech (no hints allowed).
- 2.3.8 For experienced hearing aid users, they should pick Category 4 (Comfortable).
- 2.3.9 For a new hearing aid user, the patient should pick Category 5 (Comfortable, but Slightly Loud).
- 2.3.10 If the patient does not choose the correct category, adjust the programming until his/her judgment is closer to the goal.

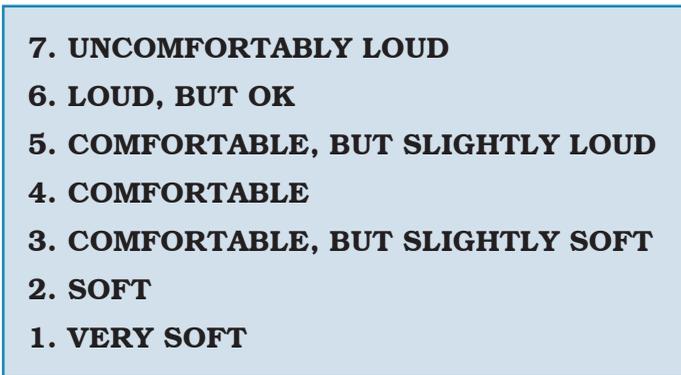
- 
- A sample of a loudness scale sheet, presented as a list of seven levels of loudness within a light blue rectangular box with a thin border. The levels are numbered 1 through 7, with 1 at the bottom and 7 at the top. The text is in a bold, black, sans-serif font.
7. UNCOMFORTABLY LOUD
  6. LOUD, BUT OK
  5. COMFORTABLE, BUT SLIGHTLY LOUD
  4. COMFORTABLE
  3. COMFORTABLE, BUT SLIGHTLY SOFT
  2. SOFT
  1. VERY SOFT

Figure 2.0 : A sample of loudness scale sheet.

### **3. VERIFYING COMFORT TOWARDS LOUD SOUNDS**

- 3.1 Materials needed : Rattle or any other loud noisemakers which represent broadband frequency range.
- 3.2 Test environment and equipment : A room typically similar to a living room.
- 3.3 Method of assessment :
  - 3.3.1 Stand in front of the patient.
  - 3.3.2 Present the noisemaker for about 15 seconds.

3.3.3 Ask the patient to choose the appropriate loudness level. The goal is Category 6 (Loud, but OK)

3.3.4 If the patient feels seriously uncomfortable, adjust the programming to reduce the MPO, until the patient rates the sound at Category 6.

#### **4. ASSESSING THE DIRECTIONAL MICROPHONE FUNCTION**

4.1 Materials needed : A CD with a track of noise (white, or pink or speech-shaped noise), samples available from University of Memphis HARL Speech Intelligibility Tests CD on [www.memphis.edu. ausp/harls](http://www.memphis.edu. ausp/harls)

4.2 Test environment and equipment : A sound proof room.

4.3 Method of assessment :

4.3.1 Program the hearing aid with Directional Microphone activated, attach the hearing aid to stethoclip.

4.3.2 Play CD using a computer, play the noise track on one of the computer loudspeaker.

- 4.3.3 Turn up the volume of the loudspeaker until the noise is loud, but comfortable.
- 4.3.4 Hold the hearing aid about 6 inches away from the loudspeaker.
- 4.3.5 Point the front side of the hearing aid towards the loudspeaker, and listen to the stethoclip.
- 4.3.6 Turn the hearing aid around, with the back of the hearing aid is toward the speaker.
- 4.3.7 Assign a subjective rating as described in Table 1.0.

Subjective rating	Description	Score
Wire backward	Louder when the back microphone faces noise	-1
Not noticeable	No difference regardless of microphone position	0
Noticeable	Front microphone louder than back microphone	1
Very noticeable	Front microphone much louder than back microphone	2

Table 1.0 : Subjective rating for patient to determine on directional microphone function.

## **5. ASSESSING THE DIGITAL NOISE REDUCTION FUNCTION**

- 5.1 Materials needed : A CD with a track of noise, and a CD containing speech track (a man or woman)
- 5.2 Test environment and equipment : A sound proof room.
- 5.3 Method of assessment :
  - 5.3.1 Activate the Digital Noise Reduction (DNR) function feature, attach the hearing aid to a stethoclip.
  - 5.3.2 Play the CD of speech track using a computer, on one of the computer loudspeaker.
  - 5.3.3 Turn up the volume of the loudspeaker until the speech is loud, but comfortable.
  - 5.3.4 Hold the hearing aid about 6 inches away from the loudspeaker.
  - 5.3.5 Point the front side of the hearing aid towards the loudspeaker, and listen to the stethoclip.

- 5.3.6 Use Windows Media Player to switch to the track with noise. The loudness of the noise will probably decrease if the hearing aid's DNR is functioning.
- 5.3.7 Time needed for DNR to activate varies across different hearing aids from 1 second to 2 ½ second or more.
- 5.3.8 Wait until the noise level seems to stabilize.
- 5.3.9 Go back to the speech track and repeat the listening test if needed.
- 5.3.10 Assign a subjective rating as described in Table 2.0. The result preferred is at least noticeable to verify the DNR function.

Subjective rating	Description	Score
Not noticeable	No reduction in loudness noticed when switching to noise	0
Noticeable	Some reduction in loudness noticed when noise introduced	1
Very noticeable	Large reduction in loudness noticed when noise introduced	2

Table 2.0 : Subjective rating for patient to rate for Digital Noise Reduction function.

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