

COCHLEAR IMPLANT

Service Operational Policy



MEDICAL DEVELOPMENT DIVISION
MINISTRY OF HEALTH MALAYSIA



All rights reserved. Except as otherwise specifically noted, the information in this publication may be reproduced, in part or in whole and by any means for individual use, without charge or further permission, provided that due diligence is exercised in ensuring the accuracy of the information reproduced.

Published in November, 2017

ISBN: 978-967-0769-13-4

This guideline is developed by the Drafting Committee and the Surgical & Emergency Medicine Services Unit, Medical Services Development Section,
Medical Development Division,
Ministry of Health Malaysia.
Aras 3-7, Blok E1 Kompleks E
Pusat Pentadbiran Kerajaan Persekutuan
62590 Wilayah Persekutuan Putrajaya
Malaysia

CONTENT

FOREWORD	I
LIST OF ABBREVIATIONS	VI
THE POLICY	
1. INTRODUCTION	1
2. OBJECTIVES OF SERVICE	2
3. SCOPE OF SERVICE	3
4. COCHLEAR IMPLANT PROGRAMME STRUCTURE	4
4.1 Organization Chart	4
4.2 National Core Committee	5
4.3 Satellite Committee	6
4.4 Members of Cochlear Implant Satellite Committee	7
4.5 Terms of Reference	8
5. GENERAL STATEMENT	10
6. PRE-OPERATIVE COCHLEAR IMPLANT EVALUATION	11
6.1 Initial Family Meeting	11
6.2 Medical Assessment	12
6.3 Paediatric Assessment	12
6.4 Radiological Investigations	12
6.5 Audiology Assessment	13
6.6 Speech and Language Assessment	16

6.7	Occupational Therapy in Children	18
6.8	Medico-Social Assessment	24
6.9	Immunization Recommendations	25
6.10	Selection Criteria	28
6.11	Bilateral Cochlear Implantation	30
6.12	Cochlear Implant Consultation/Counseling	31
6.13	Cochlear Implant Funding	32
7.	GUIDELINES FOR EX-PLANTATION AND RE- IMPLANTATION OF A COCHLEAR IMPLANT	34
8.	POST COCHLEAR IMPLANT SURGERY	35
8.1	Post-Operative Care	35
8.2	Switch-On Session and Subsequent Mapping Session	35
8.3	Audiology Assessment	37
8.4	Aural (Re)Habilitation	38
9.	OPERATIONAL POLICY FOR COCHLEAR IMPLANT SERVICE IN MINISTRY OF EDUCATION	41
	APPENDICES	53
	BIBLIOGRAPHY	65
	DRAFTING COMMITTEE	67

A young child with dark hair, wearing a white and purple striped t-shirt, is holding a white rectangular sign. The child's face is partially visible on the right side of the frame. The background is a dark, textured blue. Overlaid on the image is the word "Listen" in a large, white, textured font. Below it, the words "patience", "perseverance", "my", "needs", "talk", and "commitment" are written in a smaller, white, cursive font, arranged around the word "Listen".

patience Listen
perseverance
my needs talk
commitment

FOREWORD

DIRECTOR GENERAL OF HEALTH MALAYSIA



The World Health Organisation (WHO) has defined Hearing Impairment as one of the major public health and social problems and estimates that there are 250 million people who are deaf or who have impaired hearing (WHO, 2005). Early detection and intervention can reduce the disability and morbidity experienced by these individuals. The cochlear implant is a surgically implanted medical device that

can bestow or restore hearing in a select group of hearing impaired individuals. The surgery is just one component of the process of rehabilitating a cochlear implant recipient. Intensive audiological and speech therapy is required both before and after surgery.

The National Cochlear Implant Programme in the Ministry of Health (MOH) was launched in 2008. The team was formed of specialists and professionals to select and optimize management of cochlear implant patients. A total of 7 hospitals in Malaysia were included in this pioneer programme which has expanded to 10 hospitals currently.

Since the inception of the programme, more than 200 patients throughout Malaysia have been implanted. Our professionals have gained considerable experience over the years and similarly there have been advances in implant technology. Taking these into consideration as well as recent evidences in literature, there is a need to review and revise our operational policies. I would like to congratulate the Medical Development Division and the Otorhinolaryngology fraternity for taking the initiative and efforts to update the operational policies in line with current medical practice.

Thank You.

A handwritten signature in black ink, appearing to read 'Jheh', with a long horizontal flourish extending to the right.

YBhg. Datuk Dr Noor Hisham Abdullah
Director General of Health Malaysia

ADVISOR TO NATIONAL CORE COMMITTEE OF COCHLEAR IMPLANT SERVICE



Cochlear implant services in Malaysia started in 1995 where it was largely restricted to academic institutions and University hospitals settings. However, with the nationwide launch of The National Cochlear Implant Programme, it has provided the opportunity for this service to be made available to key hospitals. As a result, recognized Otolological centers were equipped not only with the state-of-the art equipment but also fully trained and internationally

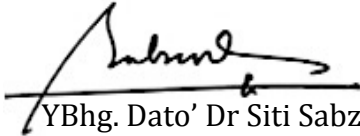
recognized surgeons to provide care and service.

Medical Development Division, MOH has taken the right course and direction to implement the Cochlear Implant Programme and it has shown to be very successful with 78% of prelingual and 96.4% of our postlingual implantees were able to understand common phrases without lip reading (CAP score 5 and above) at 24 months post implant. This success means that we are providing the best opportunity for hearing impaired patients and a better future for them.

As the public becomes more educated and exposed to current medical technologies especially in the form of rehabilitation of the hearing impaired, a coordinated and efficient operational policy is crucial in order to provide better medical care, in tandem with the Ministry's mission to provide Malaysia with a world-class healthcare system.

I would like to congratulate Dr Fadzilah Ismail and her team for their contributions to this reviewed Cochlear Implant Standard Operational Policy (CI-SOP). I hope the collaboration would continue and I am sure all healthcare providers would find this document useful.

Thank you,



YBhg. Dato' Dr Siti Sabzah binti Mohd Hashim
Advisor, National MOH Cochlear Implant Programme,
National Advisor, Otorhinolaryngology Services, MOH

CHAIRMAN OF NATIONAL CORE COMMITTEE OF COCHLEAR IMPLANT SERVICE



The National Cochlear Implant Programme in the Ministry of Health has matured considerably since its beginnings in 2008. The number as well as experience of the professionals involved has increased markedly. More than 200 cochlear implant surgeries have been performed.

We started with 7 designated centers. Over the last 5 years, 3 additional centers were developed bringing the total number of designated centers to 10. Interdisciplinary cooperation between surgeons, audiologists, speech therapists, paediatricians, radiologists, medical social officers, psychologists and representatives from the Ministry of Education has been exemplary. This level of cooperation has to be maintained and further strengthened especially with our educators as we seek a holistic solution for the implanted children whom we hope will be integrated into mainstream schooling.

The Cochlear Implant Service Operational Policy is developed to guide all professionals involved to practice cochlear implantation to the highest professional and ethical standards. By outlining policies and procedures based on current best practices, this policy sets standards for the cochlear implant practice in the MOH hospitals. We have also taken the opportunity to introduce policies that reflect a shift towards patient centered practice with greater emphasis on patient safety and communication. In this current edition, the committee has decided to include issues that were unprecedented. Issues that were learned from feedbacks and observations in patients care. I believe both health care managers and providers involved in the cochlear implant service will find this document useful.

It took a great amount of time and depth of knowledge to revise this Cochlear Implant Service Operational Policy. I would like to thank all colleagues in the review committee who have helped update this document and all those who have been directly or indirectly involved in the publication of this document.

Thank you,

A handwritten signature in black ink, consisting of several loops and a long horizontal stroke, positioned above the printed name.

Y.M. Dr. Tengku Mohammed Izam Bin Tengku Kamalden
Chairman Of Cochlear Implant Programme

LIST OF ABBREVIATIONS

AAC	Alternative Augmentative Communication
ABR	Auditory Brainstem Response
APHAB	Abbreviated Profile of Hearing Aid Benefit
ASSR	Auditory Steady State Response
AVT	Auditory Verbal Therapy
BOA	Behavioral Observation Audiometry
BTE	Behind The Ear
CG	Common Ground
CI	Cochlear Implant
COSI	Client Oriented Scale of Improvement
dB SPL	Decibel Sound Pressure Level
EARS	Evaluation of Auditory Responses to Speech
ENT	Ear, Nose and Throat
GASP	Glendonald Auditory Screening Procedure
HIB	Haemophilus Influenza
HINT	Hearing in Noise Test
IQ	Intelligent Quotient
KKM	Kementerian Kesihatan Malaysia
LiP	Listening Profile
MAIS	Meaningful Auditory Integration Scale

MOH	Ministry of Health
MRI	Magnetic Resonance Imaging
MTP	Monosyllabic-Trochee-Polysyllabic Test
MUSS	Meaningful Understanding of Speech Scale
NGO	Non Governmental Organisation
OAE	Evoked Otoacoustic Emissions
OKU	Orang Kurang Upaya
ORL	Otorhinolaryngology
PCV 7	Pneumococcal Conjugate Vaccine
PPV23	Pneumococcal Polysaccharide Vaccine
PTA	Pure Tone Audiometry
REAR	Real Ear Aided Response
RECD	Rear Ear Coupler Difference
REIR	Real Ear Insertion Response
ST	Speech Therapist
VRA	Visual Reinforcement Audiometry
3FA	Three Frequencies Average
3PK	Pusat Perkhidmatan Pendidikan Khas



patience Listen
perseverance
my needs talk
commitment



**THE
POLICY**

1 INTRODUCTION

Cochlear Implant Service is one of the important specialty services provided by trained Otologists, Audiologists, Speech Therapists and other related specialties for hearing impaired patients with the support and encouragement of the Medical Development Division, Ministry of Health (MOH) since 2006.

Patients with severe to profound sensorineural hearing loss with minimal or no benefit from super power hearing aids. They are able to hear environmental sounds but not for speech information. Cochlear implant devices were invented to help these children in speech development as early as possible and for adults to regain their hearing.

After successful surgery, the implantees must undergo intensive audiological (re)habilitation and speech language therapy sessions. It is a continuous process that involves active participation of the patient, family, parents/caregivers (for paediatric patients), and medical/non medical professionals.

This policy document is intended to guide health care providers, hospital managers and policy makers on the referral; requirements, procedures and development of cochlear implant service in the Ministry of Health hospitals.

The document outlines optimal achievable standards in accordance with best practice and guidelines. It can be used as the best practice standards for all related professionals in cochlear implant management.

The document shall be reviewed and updated periodically or when the need arises.

2 OBJECTIVES

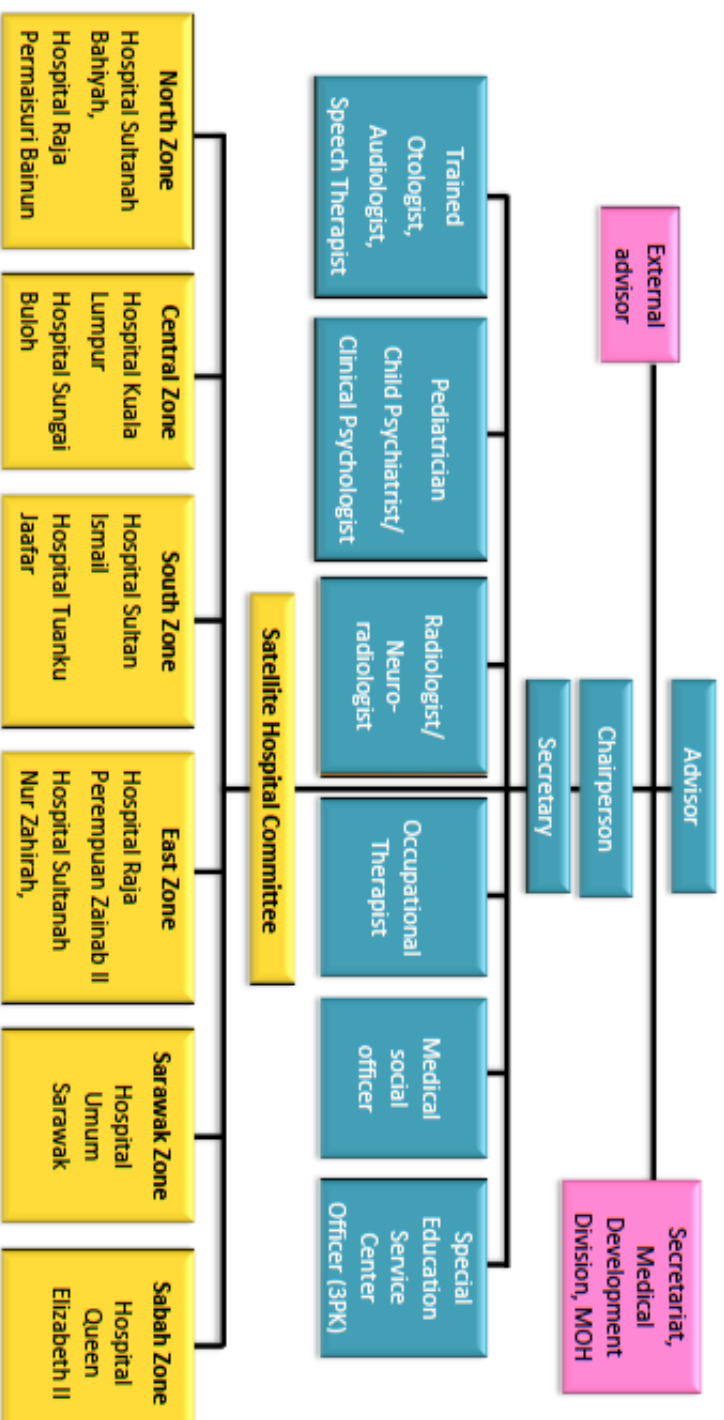
- 2.1 To give recommendations to the potential candidates and parents of the affected children on the candidature, potential benefits and realistic expectations related to hearing, speech and language development. To ensure the cochlear implant programme will be carried out safely and effectively.
- 2.2 To maximize the potential for the implantees to improve speech perception and articulation, to acquire language and communication skills through effective coordination of the multi disciplinary team approach.
- 2.3 To promote placement in mainstream school programmes for the implantees to gain equal education opportunities with appropriate support services.

3 SCOPE OF SERVICE

- 3.1 The National Cochlear Implant Programme provides surgery, audiology, speech and language (re)habilitation for the selected candidates.
- 3.2 The National Cochlear Implant Programme evaluates financial and educational needs, provides counselling and assists parental support groups.
- 3.3 The National Cochlear Implant Programme provides a national database on cochlear implant patients in the Ministry of Health for analysing outcomes and for research purposes.

4 COCHLEAR IMPLANT PROGRAMME STRUCTURE

4.1 The Organization Chart



4.2 National Core Committee

4.2.1 National Core Committee consists of:

Advisor	: Head ORL Service
Chairman	: Appointed Senior Otologist in Ministry of Health
Secretary I	: Audiologist
Secretary II	: Speech Therapist
Elected Members	: Trained ORL Surgeons Audiologist Speech Therapist Paediatrician Clinical Psychologist / Clinical Psychiatrist Neuroradiologist / Radiologist Special Education Service Officer (3PK, Ministry of Education) Medical Social Officer Occupational Therapist
External Advisors	: Cochlear Implant Team, UKM Appointed ORL Consultants from other Institutions or Recognized individuals

4.3 Satellite Committee

4.3.1 The satellite committees are divided into zones:

North Zone

- i. Hospital Sultanah Bahiyah, Alor Setar, Kedah
- ii. Hospital Raja Permaisuri Bainun, Ipoh, Perak

Central Zone

- i. Hospital Kuala Lumpur, Kuala Lumpur
- ii. Hospital Sg Buloh, Sg Buloh, Selangor

South Zone

- i. Hospital Tuanku Jaafar, Seremban, Negeri Sembilan
- ii. Hospital Sultan Ismail, Johor Bahru, Johor

East Zone

- i. Hospital Raja Perempuan Zainab II, Kota Bharu, Kelantan
- ii. Hospital Sultanah Nur Zahirah, Kuala Terengganu, Terengganu

Sarawak Zone

- i. Hospital Umum Sarawak, Kuching, Sarawak

Sabah Zone

- i. Hospital Queen Elizabeth, Kota Kinabalu, Sabah

4.4 **Each Cochlear Implant Satellite Committee consist of:**

Trained ORL Surgeons

Audiologist

Speech Therapist

Neuroradiologist / Radiologist

Clinical Psychologist / Child Psychiatrist

Paediatrician

Medical Social Officer

Occupational Therapist

4.5 TERMS OF REFERENCE

4.5.1 National Core Committee

- a. Recommends the Medical Development Division of Ministry Of Health on resource needs (manpower, training, equipment, budget and service development).
- b. To develop, review and update the policies, standard operating procedure and other related documents.
- c. To adequately develop facilities and equipment in regional centres for the purpose of cochlear implantation;
- d. To adequately develop human resources in regional centres for the purpose of cochlear implantation;
- e. To recognize the competency of regional centres in the cochlear implant programme;
- f. To ensure adequate training of each cochlear implant team members;
- g. To establish a database on the MOH cochlear implant programme for the purposes of research and continuous quality improvement;
- h. To collaborate with other relevant programmes linked to the cochlear implant service such as universal hearing screening, preschool and early intervention programmes.
- i. The national committee will meet quarterly to discuss the above and other related matters.

4.5.2 Satellite Committee

4.5.2.1 *The functions of the satellite committee are:*

- a. To identify suitable cochlear implant candidates. The satellite committee shall discuss all potential candidates and only suitable candidates that fulfil the selection criteria shall be presented to the National Cochlear Implant committee for approval.
- b. To conduct preoperative evaluation and assessment of cochlear implant candidates
- c. To perform cochlear implant surgery
- d. To provide post implant rehabilitation and management.

4.5.2.2 *The satellite committee shall receive referrals for suitable cochlear implant candidates from other non-satellite hospitals in their respective zones.*

4.5.2.3 *The satellite committee may refer implantees to other non-satellite hospital or institutions for post implant rehabilitation.*

5 GENERAL STATEMENT

- 5.1 Cochlear Implant shall be considered for persons with severe to profound hearing loss and who do not attain sufficient benefits from super power hearing aids
- 5.2 Cochlear implantation should be considered only after assessment by an interdisciplinary team, which should include a valid trial/provision of hearing aids.
- 5.3 The cochlear implant committee must take into consideration medical, psychological, pedagogical, social, linguistic and family aspects of the potential candidate. In all cases the final decision on whether or not to have an implant must be made by the parents or patient.
- 5.4 To optimize outcomes, the process of candidate selection, surgery and post operative (re)habilitation shall include the following:
 - Appropriate choice of candidates, taking into account physical, neuro-physiological, psychological, audiological and family aspects;
 - Surgery performed by a qualified surgeon;
 - Selection of appropriate device;
 - Programming by a trained Audiologist;
 - Intensive (re)habilitation, efficient and effective interdisciplinary collaboration among professionals;
 - Periodic and regular interaction among committee members;
 - Continuous care of the implanted patient and his/her family;
 - Technical advice and support on device maintenance and performance;
 - General support and advice on miscellaneous issues concerning the child and the family.

6 PRE-OPERATIVE COCHLEAR IMPLANT EVALUATION

6.1 Initial Family Meeting

Parents/ caregiver/ patient who are identified for cochlear implant should attend an initial family meeting with the cochlear implant team at the Satellite Hospital.

6.1.1 The objectives of this meeting are to:

- a. Facilitate the exchange of information between family members and cochlear implant team;
- b. Provide a platform for active family participation;
- c. Identify family priorities and concerns;
- d. Identify further services required by the family and potential implantees.

6.1.2 The meeting shall discuss the following issues;

- a. Review audiological, educational and developmental progress of the potential implantees
- b. Communication skills;
- c. Explanation on the cochlear implant and potential benefit
- d. General overview of the surgical procedures, risk and possible complications.
- e. To reinforce long-term family commitment required by the programme.
- f. Funding and maintenance cost for the cochlear implant;
- g. Realistic expectations on the cochlear implant outcome.

6.2 Medical Assessment

- a. Full medical history, physical examination and investigation including immunization for Haemophilus Influenza (Hib),
- b. Reviewing medical and audiological records. This may include obtaining medical records from the referring hospitals;
- c. If there are no apparent medical and surgical contraindications to implantation, the potential implantees are required to undergo CT scan and MRI studies.

6.3 Paediatric Assessment

- a. To determine whether there may be any other developmental, behavioural and medical issues which are contraindications to surgery or (re)habilitation;
- b. Paediatricians will perform medical and developmental assessments. There may be additional blood or imaging investigations required to provide information on associated disabilities or co-morbidities;
- c. Intelligent quotient (IQ) tests when required
- d. Psychologist will provide input related to cognitive function of the potential implantees. The psychologist can also provide intervention when necessary.

6.4 Radiological Investigation

All candidates must undergo both HRCT and MRI.

6.4.1 HRCT Temporal bone;

- a. To assess the anatomy of middle and inner ear structures for suitability of cochlear implantation.

6.4.2 *Magnetic Resonance Imaging (MRI) brain and IAM;*

- a. To provide information about the brain, inner ear and integrity of the auditory nerves.

Sedation or general anaesthesia may be used when appropriate.

6.5 **Audiology Assessment**

6.5.1 *The aims of audiological assessment pre-operatively are to;*

- a. Confirm the patient's audiological status;
- b. Ensure optimal hearing aid fitting and usage;
- c. Determine the patient's auditory sensitivity with hearing aids;
- d. Evaluate the patient's ability to make use of the auditory information perceived via his/her hearing aids;
- e. Quantify the patient's speech perception in aided condition.

6.5.2 *Evaluation Of Patient's Auditory Status;*

- a. Middle Ear Function Tests: Impedance Measurement (which includes Tympanometry and Acoustic Reflex Measurement).
- b. Behavioural Tests: Ideally hearing threshold levels should be obtained at least at 500Hz, 1kHz and 2kHz in both ears using either (but not limited to) of these tests:
 - i. Behavioural Observation Audiometry (BOA)
 - ii. Visual Reinforcement Audiometry (VRA)
 - iii. Play Audiometry
 - iv. Pure Tone Audiometry (PTA)
- c. Objective Tests: These tests can be used to estimate the hearing status of a patient, to confirm the findings

from behavioural measures, and is important in diagnosing Auditory Neuropathy.

The tests are:

- i. Middle ear assessment (should include Acoustic Reflex Test)
 - ii. Evoked Otoacoustic Emissions (OAEs)
 - iii. Auditory Brainstem Response (ABR) (click and frequency specific-tone burst/chirp). Tests should include Cochlear Microphonic assessment
 - iv. Auditory Steady State Response (ASSR)
- d. Hearing Aid Assessment:
- i. Each patient should be provided with optimized amplification. This could be achieved via Probe-tube microphone measurements using either (but not limited to) of these tests:
 - Real-Ear to Coupler Difference (RECD)
 - Real-Ear Aided Response (REAR)
 - Real-Ear Insertion Response (REIR)/Real-Ear Insertion Gain (REIG)
 - ii. Aided Sound-Field Threshold
Separate ear aided thresholds should be obtained in cases of binaural fitting.

Hearing aids should be set optimally according to the DSL v 5 or NAL-NL1/ NAL-NL 2 prescriptive targets. For further details, please refer to the related guidelines.

- e. Evaluation of The Functional Benefits Of Hearing Aids Outcome Assessment

Tools that can be used to evaluate amplification benefits among older children and adult patients;

- Ling Sounds' Test
- Questionnaires and Speech Perception Tests From the EARs Test Battery:

- Listening Profile (LIP);
- Monosyllable Trochee Polysyllable;
- Open & closed set speech tests
- Meaningful Auditory Integration Scale (MAIS)
- Meaningful Understanding of Speech Scale (MUSS)
- Open-set sentences, such as Hearing In Noise Test (HINT)
- Categorical of Auditory Performance II (CAP2)
- Questionnaires: e.g. Client-Oriented Scale of Improvement (COSI), Abbreviated Profile of Hearing Aid Benefit (APHAB),,Parents' Evaluation of Aural/Oral Performance of Children (PEACH) and/ or Teachers' Evaluation of Aural/Oral performance of Children (TEACH)
- Quality of life questionnaire: e.g. Nijmegen Cochlear Implant Questionnaire (NCIQ), Hearing Environments and Reflections on Quality of Life (HEAR-QL)

f. Recommended Tests For Suitability Of A Second Implant

There are evidences of additional benefits from bilateral implants compared to unilateral implant (Johnstone, Yeager, & Noss, 2013; Sammeth, Bundy, & Miller, 2011; Vincent et al., 2012).

- i. The suitability of a second implant needs to be assessed using the same battery of tests and criteria as in the 1st CI

6.6 Speech and Language Assessment

6.6.1 Objective:

- a. To evaluate baseline level of early auditory and communication skills, prior to implantation.
- b. To evaluate appropriate behaviour towards stimulus-response training which is essential for post-operative rehabilitation.
- c. To evaluate family commitment towards therapy Programme.
- d. To prepare patient's report and recommendations for discussion in candidacy meetings.

6.6.2 Evaluation of Auditory Skills

Evaluation will include these components:

- i. Auditory awareness

Auditory awareness refers to the ability to detect or attempts to localize the presence of sounds including voice, environmental sounds and music.

- ii. Ling Sound Test

It is a screening tool to assess the audibility of speech sounds that is necessary for speech acquisition. 6 Ling Sounds represent different speech sounds from low to high frequency range in spoken language. The screening consists of detection, discrimination, identification and comprehension tasks.

iii. Auditory Memory

This test is required to assess the ability to remember words and sounds as well as to recall information that is received verbally.

iv. Auditory comprehension

This test is to assess the ability to understand longer auditory messages, including engaging in conversation, following directions, and understanding stories.

6.6.3 Evaluation of Language Skills

Evaluation will include these 3 Components:

6.6.3.1 Pre-Verbal Language Skills

Preverbal skills are the basic skills needed before speech and language begin. Preverbal skills include eye contact, joint attention, imitation, turn taking, play and matching skills.

6.6.3.2 Receptive Language Skills

The ability to understand language which includes verbal and nonverbal language.

6.6.3.3 Expressive Language Skills

The ability to use verbal and nonverbal languages for communication.

6.6.4 Evaluation of Speech Skills

The component of evaluation includes speech sounds inventory, articulation and phonological processes.

6.6.5 Evaluation of Cognition skills

To evaluate ability in thinking, reasoning, understanding, learning and remembering

6.6.6 Evaluation of social communication (pragmatic) skills

To evaluate the ability to communicate functionally during interaction and play.

6.6.7 Communication & General Behaviour Evaluation

Evaluation of communication and behaviour includes observation of communication modes and intents, which is required for listening and language learning.

6.6.8 Parental Commitment.

To observe and evaluate in the following aspects:

- a. Attendance of therapy sessions
- b. Consistency in completing Home Base Programmes
- c. Parental involvement in therapy sessions

6.7 **Overview Of Occupational Therapy In Children**

Paediatric Occupational Therapy practice reflects the concept that children achieve role fulfilment through occupational performance, maturation and development, and within the confines of social, cultural, and personal factors. The treatment should incorporate the child's strengths and needs as well as the challenges of current and future environments in order to encourage occupational competence.

6.7.1 *The Aims Of This Guideline*

- a. To create uniformity of standards and practice among therapists, so as to enhance professionalism accountability of the work done by the therapist.
- b. It defines the process of assessment, documentation and protocols of practice within the different settings.
- c. To assist and guide qualified Occupational Therapist's in implementing appropriate Occupational Therapy intervention program for cochlear implant candidates/patients
- d. As a reference for other related Allied Health Professionals

6.7.2 *The Objectives Of Occupational Therapy For Children With Cochlear Implants:*

- i. Evaluate and recognize the child's developmental levels, performance areas (Activities of Daily Living, Play and School).
- ii. Establish a process for implementing the family education and awareness about Cochlea Implant for daily routine and self-role.
- iii. Design and implement a comprehensive early intervention and treatment program to optimize development level, functional independence and learning.
- iv. Promote play as a medium in the development of motor, cognitive, communication, social interaction and psychological aspects.

6.7.2.1 Short Term Objectives

- i. To facilitate achievement of basic Activities of Daily Living skills.
- ii. To facilitate developmental milestone appropriate for children with Cochlea Implant
- iii. To facilitate and encourage appropriate and needed sensory input.
- iv. To provide psychological support for parents through educational programmes
- v. To ensure attainment of pre-academic skills

6.7.2.2 Long Term Objectives

- i. To enhance independence in ADL
- ii. To enhance and assist ability in school function (e.g.: Inclusion Class, Special Education Class and etc.)
- iii. To enhance ability of the child to participate in community activities.

6.7.3 Tools Of Assessments For Pediatric Cochlear Implant Candidates

6.7.3.1 Developmental Assessment

- i. Denver Developmental Screening Test II

Four Domain subtest (for children < 6 years old):

- a. language
- b. fine motor
- c. gross motor

- d. personal social
- ii. Sensory Profile Assessment:
 - a. Sensory Profile Caregiver Screening.
 - b. Sensory Profile Infant and Toddler
 - c. Sensory Integration Praxis Test
 - d. Short sensory profile
- iii. Pre Academic Skill Assessment / School Readiness Assessment
 - a. Developmental Test Visual Perception (DTVP II)
 - b. Beery Visual Motor Inventory (VMI)
 - c. School Function Assessment (SFA)

6.7.4 Occupational Therapy Evaluation For Children With Cochlear Implant

6.7.4.1 Occupational Performance Areas (OPA)

- a. Self-help skills
 - Feeding
 - Dressing
 - Bathing
 - Grooming
 - Toileting
 - Functional mobility
- b. Play Behaviour And Skills
 - Sharing
 - Taking turn
 - Waiting skill
 - Ability follow instruction
 - Compliance

- Sitting tolerance
 - Attending tolerance
- c. Pre-school and School Skills
- School readiness
 - Basic concept (shape, size, colour, numbers, alphabets)
 - Pre-writing skill
 - Writing skill
 - Pre- reading skill
 - Arithmetic skill

6.7.4.2 Occupation Performance Components (OPC)

- a. Neuro - musculoskeletal components
- Reflexes – primitive & secondary reflex
 - Muscle tone and strength
- b. Development of motor skills
- Gross motor
 - Fine motor
 - Coordination
 - Bilateral coordination
 - Crossing midline
- c. Sensory-motor components
- Vestibular
 - Tactile
 - Proprioception
 - Visual
 - Auditory
 - Gustatory
 - Olfactory

d. Cognitive components

- Concentration
- Attention span
- Memory
- Problem solving

e. Psychosocial components

- Peer interaction
- Play skills
- Communication
- Parent child interaction

6.7.5 Occupational Therapy Intervention For Children With Cochlear Implants

6.7.5.1 Type of Interventions (one hour/session):

- Individual and group
- Early intervention programme
- Activity of daily living training
- Fine motor training
- Gross motor training
- Pre-school skill training
- Therapeutic Play
- Behavioural intervention/modification
- Visual perception training
- Sensory Integration Intervention
- Cognitive Intervention
- Social Skill Training

Minimum frequency of sessions:

- Follow up cases: 2 times per month

6.7.6 Reassessment: 3 monthly after intervention

6.8 Medico-social Assessment

6.8.1 *Role of medical social officer:*

- To conduct biopsychosocial assessment of the implant candidate
- To evaluate family support to ensure that the patient can fully commit to the pre and post rehabilitation process
- To assist patients and family from low socioeconomic backgrounds in receiving financial assistance before and after the implant procedure

6.8.2 *Types of Assistance*

- Supportive Therapy: Consultation with the candidate/ family regarding the medical problem in relation to psychosocial needs and evaluation of the social / family support.
- Practical Assistance: Short / long term financial support and medical equipments .

6.8.3 *Assessment For Eligibility of Assistance*

The assessment includes:

- Income, financial aid and expenditure
- Verified supporting documents
- Environment, family and community support system
- Effects of illness on the candidates' social functioning

6.8.4 Referral should be made from the initial candidacy assessment.

6.9 Immunization Recommendations For Cochlear Implant Recipients

- a. Cochlear implant recipients are at risk of developing bacterial meningitis. The implant itself being a foreign body may act as a nidus for infection. Other risk factors may include congenital abnormalities of the ear and cochlea, otitis media and immunodeficiency.
- b. It is therefore recommended that recipients of a cochlear implant should be vaccinated against the 2 commonest causative organisms Streptococcus Pneumonia and Haemophilus Influenza B.
- c. Below are the recommended schedules for vaccinating individuals according to age (Table 6.1 and Table 6.2). Vaccinations should be done at least 2 weeks before surgery.

i. Pneumococcal Vaccination Schedule:

Age at First Dose	Immunisation Schedule
<i>2-6 months</i>	<ul style="list-style-type: none"> • 2 doses of pneumococcal conjugate vaccine (PCV₁₃), 6-8 weeks apart • 1 booster dose of PCV₁₃ at 12-15 months • 1 dose of pneumococcal polysaccharide vaccine (PPV₂₃) at 2 years of age at least 8 weeks after the last dose of PCV
<i>7-11 months</i>	<ul style="list-style-type: none"> • 2 doses of PCV₁₃ 6-8 weeks apart • 1 booster dose of PCV₁₃ at 12-15 months • 1 dose of PPV₂₃ at 2 years of age at least 8 weeks after the last dose of PCV₁₃
<i>12-23 months</i>	<ul style="list-style-type: none"> • 2 doses of PCV 13 6-8 weeks apart • 1 dose of PPV 23 at 2 years of age at least 8 weeks after the last dose of PCV 13
<i>24-59 months</i>	<ul style="list-style-type: none"> • 2 doses of PCV 13 administered 8 weeks apart • 1 dose of PPV₂₃ at least 8 weeks after the second dose of PCV₁₃
<i>Individuals ≥ 5 years old</i>	<ul style="list-style-type: none"> • 1 dose of PPV₂₃

Table 6-1: The recommended Pneumococcal Vaccination Schedule according to age. It is recommended for the vaccination to be done at least 2 weeks prior to surgery.

- ii. Haemophilus Influenza Vaccination Schedule: HiB vaccination is already incorporated in the national immunization schedule. Medical personnel must ensure potential implantees have received complete immunization. Vaccination schedule is shown below:

Age At First Dose (Months)	Primary Series	Age At Booster Dose (Months)
2-6	3 doses, 2 months apart	15-18
7-11	2 doses, 2 months apart	15-18
12-14	1 dose	15-18
15-59	1 dose	Nil

Table 6-2: The Haemophilus Influenza Vaccination Schedule.

6.10 Selection Criteria

The satellite hospitals shall present relevant reports of suitable candidates or those requiring opinion/advice from the National Cochlear Implant committee. The committee will decide suitability of the candidate for implantation based on the following criteria:

a. The age of the candidate;

- For pre-lingual children, the child should be implanted before the age of 48 months. But selection also depends on the audiological, speech, surgical, radiological, paediatrics assessment and the progress reports on child's performance after hearing aid trial.
- There is no age restriction for cochlear implant in crossover candidates and post-lingual children and adults.

b. Hearing Loss;

The candidate should demonstrate;

- A severe-to profound hearing loss in both ears. The three frequencies average (3FA) at 500Hz, 1000Hz and 2000Hz for both ears must be more than 70 dBHL.
- In cases of postlingual adults, the candidates should demonstrate minimal functional benefit from hearing aids as measured using speech perception test (e.g. HINT & EARs) and outcome assessment tools (e.g. APHAB and COSI).

c. Hearing Aid Usage;

- The candidate should wear a hearing aid consistently during waking hours (at least 8 hours of hearing aid usage per day (Walker, Spratford, Moeller, & Oleson, 2013)).

- Aided thresholds (using optimally fitted hearing aids) at 2000Hz and above that fall outside the maximum speech range in the better ear.
- The candidate demonstrates minimal or no functional benefit from the hearing aid using measurement of speech perception.

d. Speech And Language (performance / skills);

- The candidate does not or, show only minimal improvement in terms of auditory or speech and language skills despite consistent usage of hearing aids over the trial period.
- Family should demonstrate high commitment and motivation in attending therapy sessions and carry out home-based programme.
- Family should demonstrate appropriate skills as language facilitator,
- Patient should demonstrate appropriate preverbal, cognition and social communication (pragmatic) skills.

e. Surgical And Medical Considerations;

- There should be no medical, surgical and radiological contraindications for cochlear implant surgery or rehabilitation.
- Anticipated difficulties to the placement of the cochlear implant device into the appropriate position (based on CT scan or MRI imaging) must be evaluated and the implications accepted by all involved.

f. Family Commitment;

- Families/candidates should commit to a continuous auditory learning and assessment programme offered by the team.

- Families/candidates should be well motivated and able to attend all rehabilitation appointments necessary for optimal use of the device.
- Families/candidates need to have appropriate and realistic expectations and understand the potential and limitations of a cochlear implant.

g. Other Considerations;

- Educational and developmental assessments may identify potential difficulties for the audiological or rehabilitation programme. The implications of these findings will be carefully discussed with the family and an appropriate plan agreed upon by all.
- Any psychological and behavioural issues need to be addressed as well.
- Post-lingual and crossover candidates must show commitment in continuing the auditory oral or auditory verbal method of communication.

Those who do not fulfil the selection criteria will be informed. The candidate/parents will be counselled by the satellite team to discuss alternative (re)habilitation plans (refer appendix 3).

6.11 Bilateral Cochlear Implantation

Candidates can be considered for bilateral sequential cochlear implantation when the following criteria are met;

- a. Must show definite improvement in auditory skills or consistent progress in speech and language using single cochlear implant.
- b. Candidates/family must show:
 - i. Interest to undergo the second implantation

- ii. Can afford costs for maintenance of headsets and accessories.
- iii. Must have strong family commitment to continue post op audiological and speech rehabilitation.
- iv. Candidate and family must have realistic expectations of second implant.
- c. The implant team may consider implantation after approval from the central committee.
- d. Audiological criteria for bilateral implantation:
 - Consistent user of the existing cochlear implant .
 - Has been using hearing aid on the unimplanted ear consistently.
- e. Must have no medical or surgical contraindications.

6.12 Cochlear Implant Consultation/ Counselling

Upon approval by the National Cochlear Implant committee the satellite team shall discuss with guardian the following issues;

- a. Date for surgery;
- b. An overview of the surgical procedure;
- c. Potential surgical risks;
- d. Post-operative care;
- e. Precautions for cochlear implant users e.g. sports, travel, infections;
- f. Availability/option implant technology;
- g. Possible device complications.
- h. Post implant financial implication

6.13 Cochlear Implant Funding

Funding for this programme will be obtained from the following sources:

6.13.1 First Implant:

- Cochlear Implant Programme, Ministry of Health
- Public Service Department (JPA)
- Tabung Bantuan Perubatan (TBP)*
- Self-funding.
- Other sources e.g. non-governmental organisation (NGO), insurance etc.
- Other government agencies

6.13.2 Upgrading:

To upgrade the speech processor; case may need to be presented to the National Cochlear Implant Committee. Sources are:

- Public Service Department (JPA)
- Tabung Bantuan Perubatan (TBP)*
- Self-funding.
- Other sources e.g. non-governmental organisation (NGO), insurance etc.
- Other government agencies

6.13.3 Second implant:

- JPA
- Other government agencies (e.g. State Government)
- TBP*
- Self-funding

- Other sources e.g. non-governmental organisation (NGO), insurance etc.

6.13.3.1 Terms And Conditions Of Second Implant:

- I. Patient has significant difficulty and limited capability to hear and to function in social and working environment despite benefitting from the first implant, due to the limitation of monaural hearing. Refer topic 6.11 on the expected benefits.
 - II. Consideration strictly applies to:
 - a. Children especially below 5 years of age.
 - b. Students and active working group whose activity of daily living, job description and job standing, clearly indicates extra cost-effective benefits with a second implant.
- * The National Cochlear Implant Committee will provide technical input to the TBP committee on the needs and indications as per needed.

7 Guidelines For Ex-plantation And Re-Implantation Of A Cochlear Implant

7.1 There are several reasons that a cochlear implant may have to be removed. Among them are:

- a. Medical reasons
 - The skin flap becomes infected.
 - Implant rejection.
 - Head trauma resulting in damaged implant.
 - Extrusion or migration of the implant receiver or electrode array (e.g. the implant receiver and or electrode array extruded or migrated out of place).
- b. Device failure
 - Technical failure of the implant.

7.2 Device failure is when the characteristics of the device is outside the manufacturer's specification resulting in a loss of clinical benefit. Depending on clinical circumstances, re-implantation would usually be recommended. Such failures must be reported to the manufacturer and National CI Committee. The manufacturer shall incur the cost of the implant if, it is within the warranty period.

7.3 The exceptions is when the device is still of benefit to the patient although its measured characteristics are outside the manufacturer's specification. This is called a characteristic decrement. Such failures shall be reported to the National CI Committee. The committee shall decide if or when a re-implantation should become necessary. The device would then be deemed to have incurred a device failure and should be reported as such.

8 POST-COCHLEAR IMPLANT SURGERY

8.1 Post-Operative Care

- 8.1.1 The mastoid dressing shall be applied for 2 days.
- 8.1.2 In uncomplicated cases, the patient shall be discharged after 2 days.
- 8.1.3 The wound shall be reviewed 2 weeks post-operatively before the device is switched-on and during the switch-on session.

8.2 Switch-On Session and Subsequent Mapping Session

- 8.2.1 The implanted device shall be activated (switch-on) after two to three weeks post-operation when the wound has healed.
- 8.2.2 A trained audiologist must perform the cochlear implant mapping.
- 8.2.3 For the first 3 years the mapping schedule will be as follows;
 - Weekly for 2 weeks;
 - Monthly for 3 months;
 - 3-monthly for 6 months;
 - 6-monthly until 2nd year of rehab;
 - Annually or as needed

- 8.2.4 Electrodes that are not measured in the initial mapping session shall be measured in the second and subsequent visits.
- 8.2.5 A free field aided audiogram is obtained within the first month of switch on and regularly thereafter to determine the patients' ability to detect soft sound with the implant.
- 8.2.6 It is important to monitor the outcome of the programme and carry out mapping procedures regularly to ensure each patient's listening and learning potentials are optimized.

8.3 Audiology Assessment

8.3.1 The following are the assessment tools used to measure outcome using cochlear implant;

- i. Unaided hearing threshold at least after 6 months of cochlear implantation.
- ii. Aided thresholds (using warble tones tested at 250 Hz – 8000 Hz) for each ear (binaurally implanted/bimodal).
- iii. Selected EARS speech test battery which may include (not limited to);
 - LiP
 - MTP (all age group) – syllable and word discrimination
 - Close-set sentences (children who have acquired sufficient vocabularies);
 - Open-set (Glendonald Auditory Screening Procedure) GASP sentences (children who have acquired sufficient vocabularies);
 - MAIS & MUSS questionnaires (all age group).
- iv. Hearing in Noise Test (HINT)
- v. Categorical of Auditory Performances II
- vi. Questionnaires: e.g. COSI, APHAB, HHIA/HHIE, Parents' Evaluation of Aural/Oral Performance of Children (PEACH) and/ or Teachers' Evaluation of Aural/Oral performance of Children (TEACH)
- vii. Quality of Life Questionnaires: e.g. Nijmegen Cochlear Implant Questionnaire (NCIQ), Hearing Environments and Reflections on Quality of Life (HEAR-QL)

8.4 Aural (Re)Habilitation

8.4.1 The objectives of audition, speech and language sessions are;

- i. To obtain baseline levels after implantation through formal or/and non-formal assessments which includes:
 - Audition
 - Speech
 - Language
 - Communication
- ii. To develop and practice an inter-disciplinary team approach in order to fulfil the child's and family's needs in a holistic manner.
- iii. To provide (re)habilitation to get optimal auditory, speech and language skills with the cochlear implant.
- iv. To coach and guide family/candidate to be the language facilitator.
- v. To ensure continuous family commitment towards therapy.
- vi. To assist the child/implantees to acquire/improve spoken language skills that is necessary to enhance the quality of life.
- vii. To prepare reports and recommendations for further management (if necessary).

8.4.2 Methods Of Evaluation

- a. Auditory skills assessment based on hearing age development every 6 months.
- b. Parent- child interaction checklist (every 6 months).
- c. Speech production and language assessment (every 6 months).
- d. School & home visit (when necessary).

8.4.3 Speech and Language Progress

8.4.3.1 *Continue monitoring auditory, speech, language, and communication development every 6 months.*

8.4.3.2 *Implantees who do not achieve targeted goals in 2 years of (re)habilitation should be:*

- a. *Report the evaluation findings and recommendations to National CI committee.*
- b. *Continue rehabilitation using Augmentative & Alternative Communication (AAC).*

8.4.4 Termination of (Re)Habilitation Programme & CI usage

8.4.4.1 *The following may be grounds for terminations of the post-operative (re)habilitation programme;*

- a. Completed (re)habilitation successfully.
- b. Failure to attend first year post-operative (re)habilitation appointments for at least 70% of speech therapy sessions.
- c. Implantees who default from 3 consecutive speech therapy sessions.
- d. Implantees who refuse AAC offered by speech therapist in CI National Programme.
- e. Implantees enrol in AAC programme at other centre.

Any speech therapist who wishes to discharge implantees from the (re)habilitation programme due to point (b) and / or (c) and / or (d) and / or (e) must report to the National CI committee.

8.4.4.2 *Failure of consistent usage for 6 months is considered as non-compliant. Thus, the patient or the family need to return the external component and related accessories to the satellite hospital.*

8.4.5 **Aural (Re)Habilitation Centres**

8.4.5.1 *Centres performing cochlear implants should ensure their programme includes a detailed and comprehensive (re)habilitation plan.*

8.4.5.2 *Non MOH Centres performing cochlear implants who wish to transfer their patients to a MOH facility can be considered if:*

- a. Candidacy selection conforms to the MOH SOP
- b. For logistic reasons if it facilitates the process of rehabilitation
- c. Request and permission for such rehabilitation is obtained prior to the implant surgery
- d. In special circumstances, the MOH facility may accept, on a case by case basis, patients from non MOH centres after discussion and agreement between both centres
- e. The process of rehabilitation at the MOH facility will be determined by the MOH Cochlear Implant Service Operational Policy; capability and available expertise.

9 OPERATIONAL POLICY FOR COCHLEAR IMPLANT SERVICE IN MINISTRY OF EDUCATION

9.1 Introduction

9.1.1 Ministry of Education (MOE) provides access to quality education to all students regardless of race, religion, economic background as well as disability. Hence, students with *Cochlear Implant* have the same opportunity with other students to go to school and receiving quality education and related support services needed.

9.1.2 MOE is putting more effort in ensuring that these students can enrol in schools that are close to their home either in the Special Education Integrated Classes (Program Pendidikan Khas Integrasi - PPKI) or Inclusive Classes (Program Pendidikan Inklusif - PPI) in the mainstream schools or Special Education Schools (Sekolah Pendidikan Khas - SPK) throughout Malaysia.

9.2 School Options

9.2.1 Inclusive Education Programme (PPI)

PPI provides opportunity for the students with special needs to be together with their typical peers and learning side by side in the same class in the mainstream school. PPI can be in a form of full inclusion or partial inclusion.

9.2.1.1 Full Inclusion

Students with special needs are placed in the classes together with the typical students. The special needs students will fully follow the national curriculum and will learn all academic subjects together with their typical classmates. At the same

time they will also fully participate in extracurricular activities together with their typical classmates.

9.2.1.2 *Partial Inclusion*

Students with special needs will study together with their typical peers in certain classes or for only extracurricular activities. For example if they are good in drawing, they will be placed in the art classroom together with other typical students. The partial inclusion placement will depend on the students' abilities as well as talents.

9.2.2 *Special Education Integrated Programme (Program Pendidikan Khas Integrasi - PPKI)*

PPKI provides special education classes inside the mainstream schools where all students with special needs are gathered and learning together side by side. Special education teachers are responsible in the teaching and learning process in these classes.

9.3 **Terms and Condition**

9.3.1 Schooling age:

- Preschool Level is from 4 to 6 years old
- Primary School Level is from 7 to 14 years old
- Secondary School Level is from 13 to 19 years old

9.3.2 Malaysian citizen.

9.3.3 Their disabilities are confirmed by medical practitioners

9.3.4 The students with special needs must gone through a trial period of not more than 3 months in either government or government aided schools. The trial period will allow schools to recognize the suitable school placement for them.

9.4 **Registration:**

9.4.1 In getting ready to preschool, parents of cochlear implants children must register at the nearby schools 2 years in advanced. However, preschool level is not yet compulsory for all students including the Cochlear Implant children.

9.4.2 Registration must be completed online through Year 1 Student Management System (eSPPM).

9.4.3 Any problem encountered during the registration process online, parents or family members can always contact the nearest District Education Office (Pejabat Pendidikan Daerah - PPD), State Education Office (Jabatan Pendidikan Negeri - JPN) or Special Education Support Service Centre (Pusat Perkhidmatan Pendidikan Khas - 3PK).

9.5 **Students Placement**

9.5.1 Preschool placement for Cochlear Implants children in the government and government-aided schools is under the management of State Education Department (JPN) and District Education Office (PPD).

- 9.5.2 The placement process will take into the consideration the proposed placement by medical practitioners as stated in the Disability (OKU) Registration Application Form [BPPOKU (Changes) 1/2012] as well as the result of the trial period of not more than 3 month that the children have to go through when they enrolled in schools.
- 9.5.3 In the evaluation process, State Education Department (JPN) and District Education Department (PPD) can request assistance for expert advice from Special Education Division (Bahagian Pendidikan Khas - BPKhas) in making decision on the suitable placement.
- 9.5.4 The placement for Cochlear Implants children in PPBI must meet the requirement below:
- 9.5.4.1 *The classroom size for PPI classes in the mainstream schools must have less than 35 students.*
 - 9.5.4.2 *Number of special needs students to be placed in inclusive classes must not be more than 5 students in each class.*
 - 9.5.4.3 *Cochlear Implants students should be placed in classes where their achievements are at par with their peers in the mainstream class.*
 - 9.5.4.4 *PPI classes must be allocated at ground floor for easy access especially for students with wheelchairs.*
 - 9.5.4.5 *The Cochlear Implants student's placement in PPI requires a written approval from parents.*

9.6 School Supports

9.6.1 Every Cochlear Implant students who enrolls either in government or government aided schools are eligible for the following services :

9.6.1.1 *Special Students Allowance (Elaun Murid Khas - EMK). The eligibility requirements are;*

- The students must be a Malaysian citizen,
- All students at preschools up to form 6 and matriculation are eligible to receive the allowance
- Attending school either government or government aided school
- Disability card holder (OKU card),
- Does not receive any other OKU's allowances from any other government agencies or NGO's.

9.6.1.2 *Eligibility for 2 years extension of schooling years:*

Based on "Surat Pekeliling Ikhtisas Bil 16/2002", Cochlear Implants students in PPKI can take extra 2 years of schooling period subject to requirements as follow:

- The period taken cannot be more than two years at primary level; or
- The period taken cannot be more than two years in a secondary level; or
- The 2 years period can be equally spread with one year in a primary level and one year in a secondary level
- School extension period in schools that offer inclusive classes (PPI) without special education integrated classes (PPKI) must apply for approval from the Minister of Education

9.6.1.3 Public Examination

- i. Special needs students including Cochlear Implants students are eligible to receive special support services during the examination period
- ii. Application of special support services during examination can be forwarded to the Examination Board through schools for approval.
- iii. The special support services made available are based on individual needs of the students (e.g.: separate examination room, additional ½ hour of examination time, a reader or translator).

9.7 Hostel Accommodation

9.7.1 Students with special needs are eligible to be given the opportunity to stay in hostels (provided by schools/facilities under MOE).

9.7.2 To apply, parents are required to inform the schools authorities on their children health status by attaching the medical reports either from government or private hospital to assist the panel on deciding the most suitable accommodation for the student.

9.8 Support Services

Continuous special education support services are required in helping to strengthen the teaching and learning process for better outcomes. Among the support services available are financial aids, learning materials and expert assistance.

9.8.1 *Special Equipment*

Special education classes are equipped with special equipment to assist students in learning as well as to minimize the impact of having disabilities.

9.8.2 *Student Assistance/Aids (Pembantu Pengurusan Murid - PPM)*

PPM is allocated based on the ratio of 1 PPM to 10 students for primary school and 1 PPM to 15 students for secondary school. Maximum allocation for PPM is 9 persons in a class and 9 in the hostel. The ratio is subjected to revision from time to time.

9.8.3 *Resource Teacher (Guru Resos)*

In special education integrated programs (PPKI) that offer inclusive classes (PPI), special education teachers will take a role of resos teacher for the school until the actual resource teacher can be permanently placed in the school.

9.8.4 *Special Education Service Centre (3PK)*

- Special Education Service Centre was established by the Ministry of Education to provide necessary and relevant support services to special needs students in schools. The intervention and rehabilitation activities given to special needs students are aimed at preparing the students to be more ready for learning in classroom so that they can study better to achieve academic excellence and at the end of schooling they can become independent individuals and acquire jobs.
- The support services provided by various experts such as audiologist, speech pathologist, occupational therapist and others will help the students to minimize the barriers to learning and maximize their potential.

9.9 Early Intervention Programme

- Early Intervention Programme is designed to assist in readiness of children with special needs to go to school as well as to minimize the impact of disabilities through the therapy activities as early as possible.
- Early intervention can identify the needs for additional special equipment to assist and support Cochlear Implants students.
- Cochlear Implants students are referred to 3PK officers at each state according to satellite hospital as well as the list given to 3PK.

9.10 Personnel at 3PK

9.10.1 Audiologist

- i. Using screening tests to screen hearing problems that affect language development.
- ii. Using diagnostic tests to identify types and levels of hearing impairment.
- iii. Identify the needs for hearing habilitation and rehabilitation among the children starting at the age of 2 years.
- iv. Plan for hearing awareness programs and its impact on education.
- v. Suggest relevant special equipment suitable to assist teaching and learning.
- vi. Provide advices in deciding on the education and career pathways for the students.

9.10.2 Speech Language Therapist

- i. Screen language and speech difficulties that hinder communication and learning using relevant screening test.
- ii. Evaluate functioning levels in language and speech using relevant instruments
- iii. Identify levels and types of language and speech difficulties through diagnostic tests
- iv. Plan and implement remedial, speech intervention and its impact on learning
- v. Give consultation in identifying the needs for speech programs in education

9.10.3 Clinical Psychologist

- i. Carry out screening, assessing and rehabilitation activities
- ii. Provide follow-up according to the client needs
- iii. Give mental health therapies, physical and psychosocial to ensure clients achieve optimum potential
- iv. Develop and suggest therapy plan at home for parents to help in strengthening the client advocacy
- v. Provide health education
- vi. Carry out behaviour modification activities with parents and family members or guardian
- vii. Plan and arrange for health related programs inside and outside schools to educate teachers

9.10.4 Occupational Therapist

- i. Provide accurate and effective occupational rehabilitation to clients for them to achieve their optimum potential and independent in doing daily activities and learning activities at school

- ii. Identify problems faced due to the impairment in order to improve their capabilities so that they can learn better in the classroom
- iii. Receive and carry out tasks given from time to time
- iv. Suggest the usage of suitable special equipment that can help them to function better

9.10.5 Peripatetic Officers

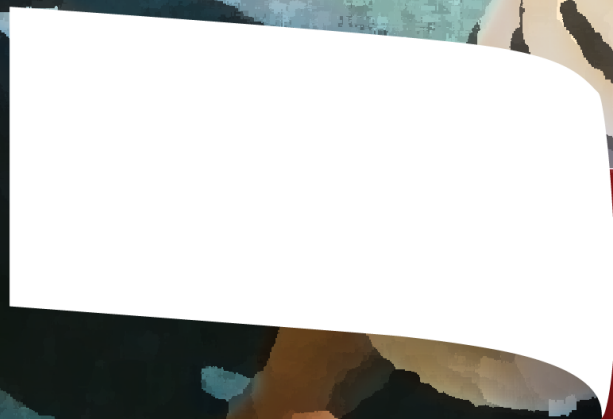
- i. Screen for children with special needs in schools
- ii. Identify students who have needs and other problems that hinder their abilities to learn
- iii. Provide referral to relevant professionals in assisting the students
- iv. Identify learning needs as well as the need for special equipment
- v. Evaluate children with special needs in the school placement process
- vi. Advise teachers and parents on the problems faced by their children and students
- vii. Help in preparing referral letters to hospital or social welfare department to receive services
- viii. Carry out partnership and collaboration with all agencies to provide relevant professional support for the special needs students
- ix. Carry out individual therapies to help students in learning
- x. Plan for learning intervention programs
- xi. Plan for awareness programs to increase the readiness of schools

9.10.6 Information on Children with Cochlear Implants

- i. Information on children with CI is required to assist MOE in identifying and monitoring of students who need educational support.
- ii. CI team from satellite hospital should submit the following information to central 3PK:
 - Name
 - Date of Birth
 - Gender
 - Identification Number
 - OKU Card
 - Current Address
 - Contact Number
 - Health Record (General development, speech development and associated medical problems).

A young child with dark hair, wearing a white and purple striped shirt, has their arms raised in the air. The background is a textured blue. The word "Listen" is written in a large, white, cursive font in the upper center. Other words are scattered around it: "patience" (top left), "perseverance" (middle left), "my" (bottom left), "needs" (middle right), "talk" (top right), and "commitment" (bottom right).

patience Listen perseverance my needs talk commitment



APPENDICES

1. Auditory Neuropathy Spectrum Disorder (ANSD)

1.1. Auditory Neuropathy is defined as:

- Absent ABR or severely abnormal morphology of waveforms at high stimulus with
- OAEs and/or present Cochlear Microphonic (CM).

1.2. Initial Assessment

The assessment should include:

- ABR (using both click and tone burst)- if absent or abnormal (ideally using insert phones), proceed with:
 - Cochlear Microphonics (CM) - perform click using separate runs of condensation and rarefaction using the same stimulus level of ABR with insert earphones.
- Otoacoustic Emissions (OAE)- transient evoked (TEOAEs) are recommended. If a robust OAE is present and repeatable, assume ANSD may be present.

1.3. Prognosis

- Both ABR and behavioural thresholds are poor predictors of speech perception abilities.
- The ABR may recover so that it is consistent with the behavioural responses and has good morphology. If the problem were caused by delayed maturation, recovery would normally occur by 12-18 months of age.
- Behavioural thresholds may improve over the first 1-2 years of life.
- Families should be informed that spontaneous improvement in auditory function has been reported up to two years of age. Cochlear implantation, therefore, should not be considered until auditory test results (**ABR and estimates of**

behavioral sensitivity) are stable and demonstrate unequivocal evidence of permanent ANSD (no change in or recovery of ABR).

- Children with ANSD should be monitored closely. The behavioural and electrophysiological testing should be performed once again prior to implant.

(Newborn Hearing Screening Programmes Clinical Group, 2013 & Bill Daniels Center for Children's Hearing, 2008)

- Preoperative radiologic studies, including CT and MRI, were found to be reliable predictors of speech perception abilities for children with ANSD after CI (Jeong & Kim, 2013; Walton, Gibson, Sanli, & Prelog, 2008).
 - Normal bony cochlear nerve canal (BCNC) and normal cochlear nerve in preoperative radiologic studies on children with ANSD were found to correlate with excellent speech perception abilities after CI.
 - Conversely, radiologic findings of a narrow or obliterated BCNC and a deficient cochlear nerve correlated with poor speech perception abilities after CI.

1.4. Intervention

- The hearing aid fitting **MUST BE** based on behavioural thresholds.
- The hearing aid fitting should be based on a prescriptive target designed specifically for children (i.e. DSL).
- Hearing aid benefit should also be measured not only using aided detection testing, but also on speech perception skills and quality of life assessment.

1.5 Additional tests for AN include:

1.5.1 *Frequency Specific-Electrocochleography (ECoChG)*

- 1.5.1.1 McMahon, Patuzzi, Gibson, & Sanli, 2008 suggests the use of “Frequency Specific-*Electrocochleography (ECoChG)*” for better delineation of site of lesion in ANSD, thus helps to determine the prognosis of cochlear implant.
- 1.5.1.2 Through this technique, they were able to measure a more accurate recording of:
- The summed extracellular currents from cochlear hair cell, i.e. Cochlear Microphonic (CM) and Summating Potential (SP),
 - The excitatory post-synaptic currents; i.e. the Dendritic Potential (DP)
 - The Compound Action Potential (CAP)
- Since the generation of action potential is a cascade of events, thus, the presence or absence of these potentials are able to indicate the site of lesion along the auditory pathway.
- 1.5.1.3 The recordings **must be measured from the cochlear round window (trans-tympanic recordings)**(McMahon et al., 2010).

1.5.2 Cortical Auditory Evoked Potentials (CAEPs)

- 1.5.2.1 CAEP can be used as an objective tool to evaluate whether amplified speech sounds are audible in infants and children fitted with hearing aids.
- 1.5.2.2 The P1-N1-P2 response is an obligatory auditory evoked potentials (AEP) from the cortical part of the brain. Its latencies are between 80ms and 200ms. It can be elicited by the onset of a sound such as a click, tone burst or speech stimuli (such as /ba/, /da/, /ga/).
- 1.5.2.3 CAEPs could also be used for older children and adults to determine the extend of auditory neuropathy (Neary & Lightfoot, 2012). If ABR is absent but CAEPs are present, the dys-synchrony is

moderate and the prognosis for amplification is better. When both ABR and CAEPs are absent, the dys-synchrony may be profound and amplification prognosis may be poor, thus indicate the potential need for cochlear implants.

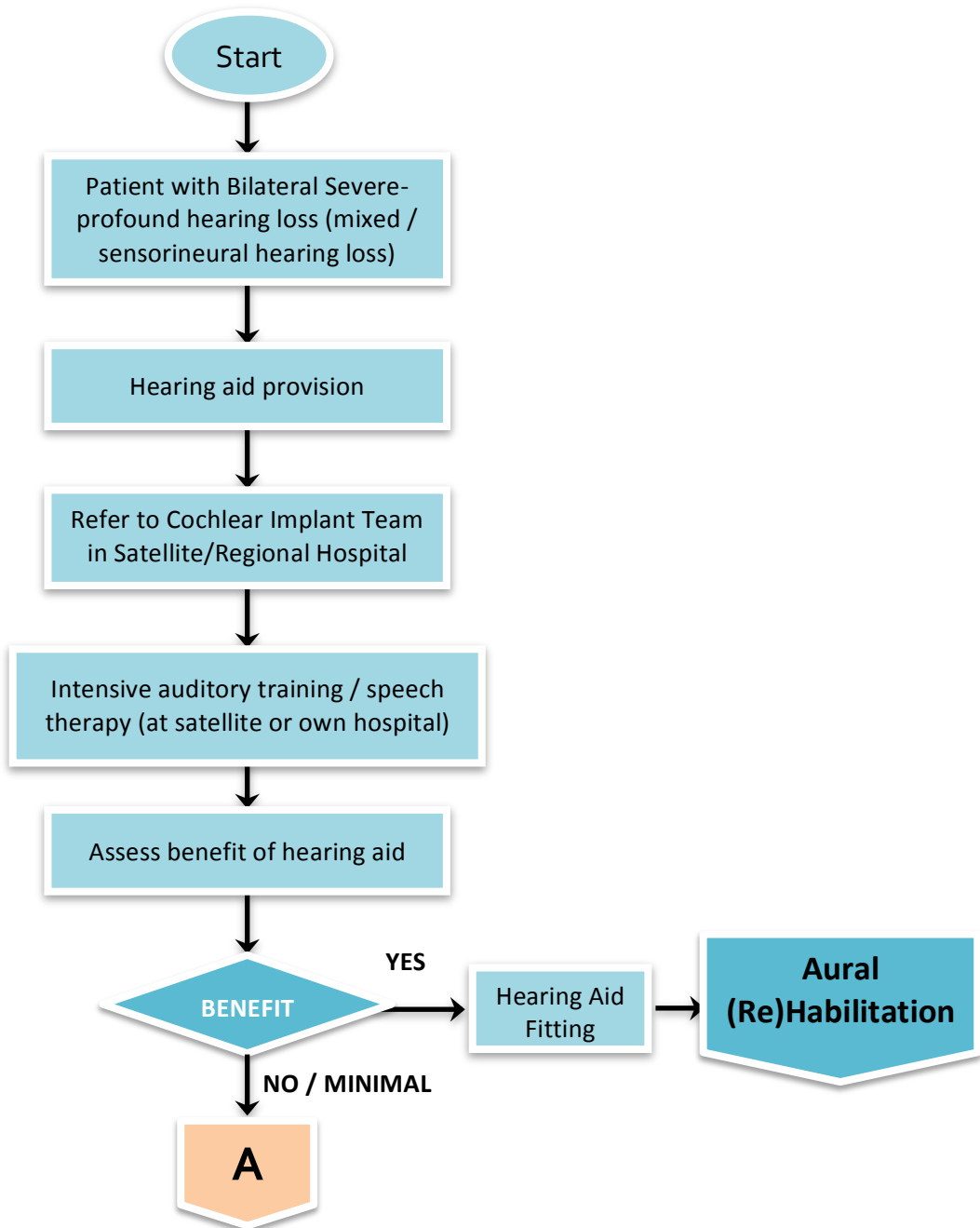
- 1.5.2.4 CAEPs may also be measured post-implantation to evaluate whether electrical stimulation is evoking an auditory response in the auditory cortex.

1.5.3 *Electrically-Evoked ABR*

- 1.5.3.1 A trans-tympanic electrically-evoked ABR (eABR) may also be used in ANSD cases to predict the outcome of cochlear implant surgery. The presence of normal eABR may indicate a significantly better outcome after cochlear implant surgery than patients with abnormal or absent eABR (Gibson & Sanli, 2007).
- 1.5.4 Further assessment using age-appropriate functional and outcome measures such as EARs, Parents' Evaluation of Aural/Oral Performance of Children (PEACH) and/ or Teachers' Evaluation of Aural/Oral performance of Children (TEACH) able to add beneficial information on the patient's hearing and speech, language and communication developments.

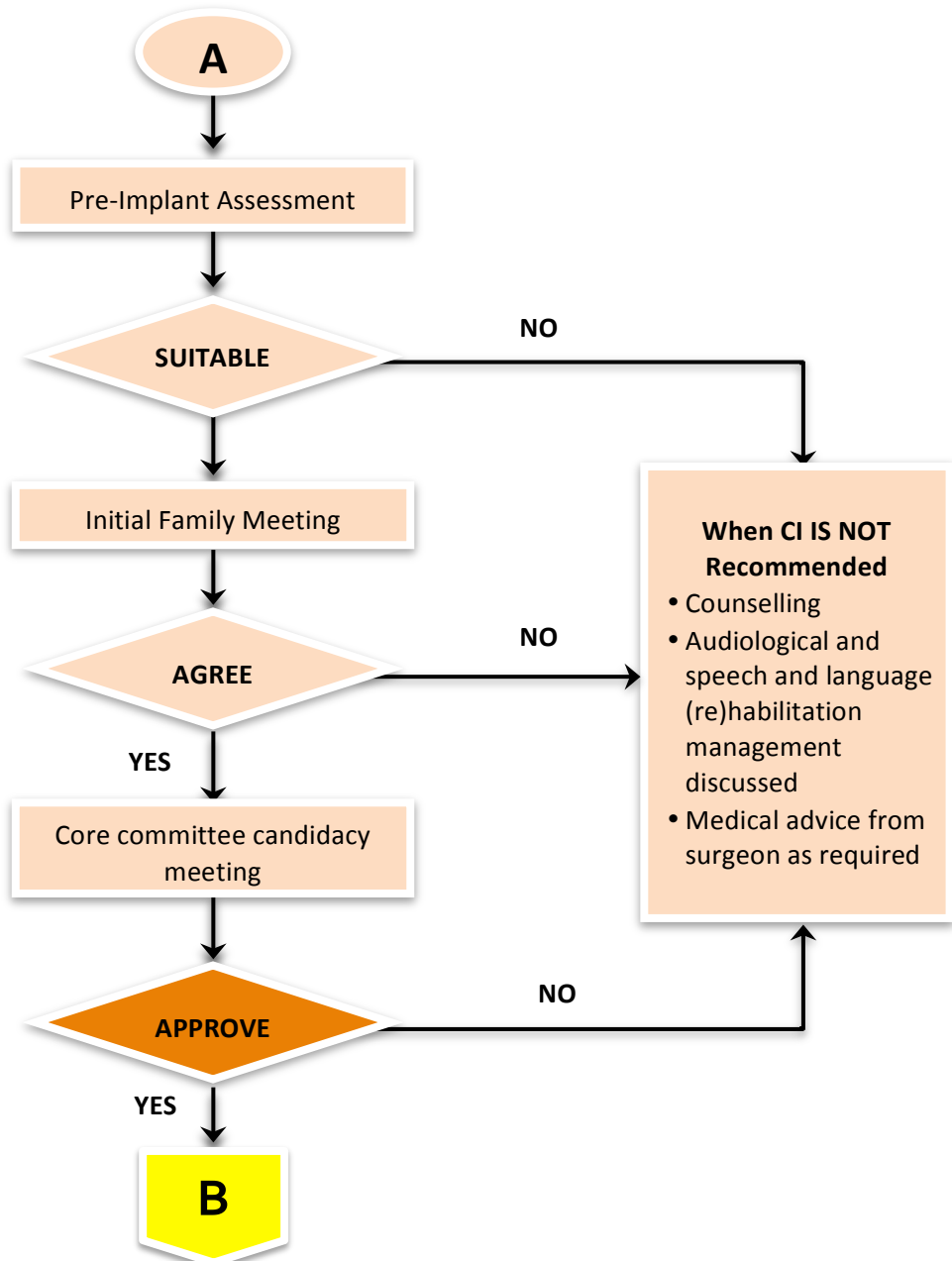
APPENDIX 2

2.1 SATELLITE HOSPITALS REFERRAL FLOW CHART



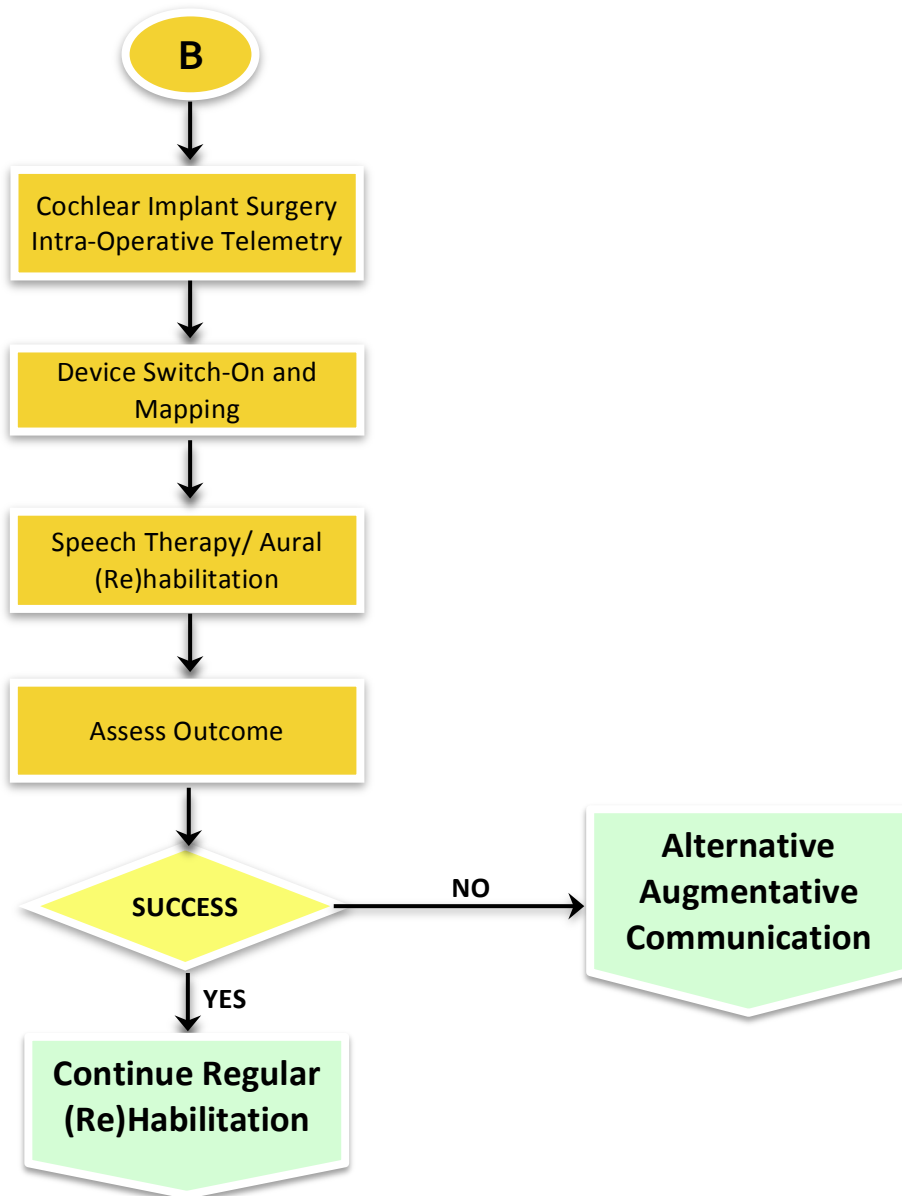
APPENDIX 3

3.1 PRE-OPERATIVE FLOW CHART



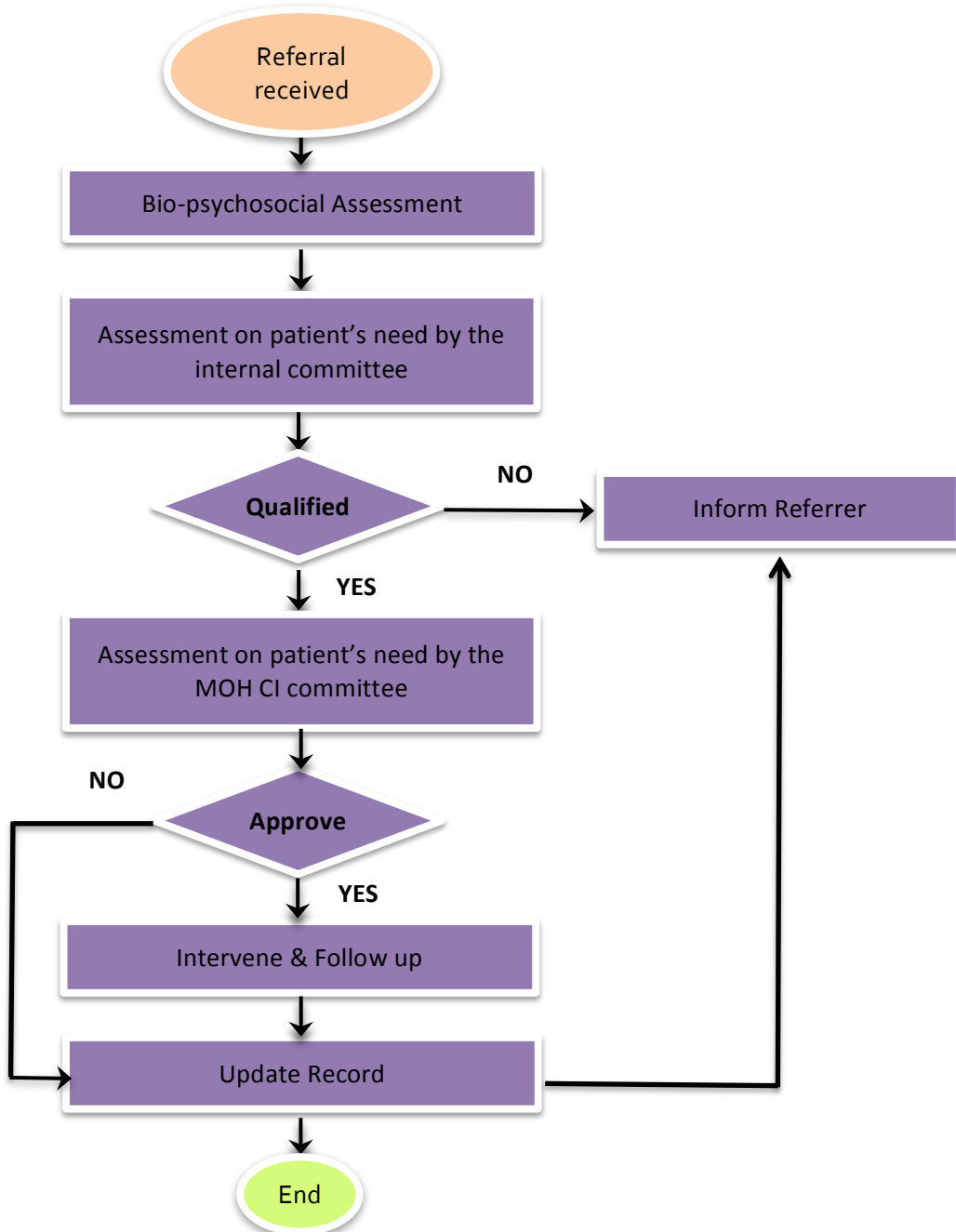
APPENDIX 4

4.1 INTRA & POST OPERATIVE FLOW CHART



APPENDIX 5

5.1 WORK PROCESS FOR COCHLEAR IMPLANT CASES IN MEDICAL SOCIAL WORK SERVICES



APPENDIX 6

6.1 Commitment form/letter

BORANG KOMITMEN PROGRAM REHABILITASI AURAL	
NAMA PESAKIT	: _____
NO KAD PENGENALAN	: _____
WARIS (IBU/BAPA)	: _____
<i>Sekiranya pesakit berumur dibawah 18 tahun</i>	
TELEFON	: _____
TARIKH	: _____

Saya _____ (pesakit/waris*) dengan ini memahami tentang penerangan yang telah diberikan oleh _____ (Pakar ORL/Pegawai Perubatan) tentang komitmen yang perlu diberikan oleh pihak saya/waris dalam memastikan program rehabilitasi aural yang dicadangkan dapat berjalan lancar.

Saya juga telah diberikan penjelasan penuh tentang keperluan dan kepentingan program ini bagi membantu saya/anak saya mencapai matlamat yang telah dipersetujui bersama. Saya :

- Mematuhi setiap tarikh temujanji Klinik Audiologi, Klinik Terapi Pertuturan dan Klinik bersama Pegawai / Pakar Perubatan ORL, seperti yang diberikan.
- Memaklumkan kepada pihak Jabatan ORL sekiranya terdapat sebarang kekangan/masalah yang boleh memberi kesan kepada komitmen terhadap proses rehabilitasi aural yang dicadangkan.

** Sila potong yang tidak berkenaan*

Yang Benar,	Disaksikan oleh,
.....
(Pesakit/Waris)	(Tandatangan & cop)

Nama:
No. K/P:

Sila berikan satu salinan untuk pesakit/waris

APPENDIX 7

7.1 Feedback letter/form for candidate to inform on results /outcome from the national candidacy meeting

SURAT MAKLUMAN KEPUTUSAN MESYUARAT JAWATANKUASA TERAS PROGRAM IMPLAN KOKLEA KEMENTERIAN KESIHATAN MALAYSIA

NAMA PESAKIT _____

NO KAD PENGENALAN : _____

WARIS (IBU/BAPA) : _____

Sebelumnya pesakit haruslah didaftarkan di rumah

NO TELEFON _____

TARIKH _____

Saya _____ (pesakit/ waris*) dengan ini memahami tentang penerangan yang diberikan oleh _____ (Pakar ORL/ Pegawai Perubatan) mengenai keputusan

LULUS Jawatankuasa Teras Koklea Implan KKM yang telah bermesyuarat pada _____ Dengan ini saya bersetuju / tidak bersetuju* untuk memberikan komitmen sepenuhnya terhadap proses rehabilitasi aurai seperti yang dibincangkan bersama pihak Jabatan ORL Saya /selaku waris kepada pesakit di atas*, dengan ini:

- **Bersetuju / dan membenarkan anak saya*** untuk menjalani pembedahan implan koklea dan mematuhi setiap tarikh rawatan susulan (sekitarnya perlu)
- Mematuhi setiap tarikh temujanji Klinik Audiologi
- Mematuhi setiap tarikh temujanji Klinik Terapi Pertuturan
- Memaklumkan kepada pihak Jabatan ORL sekiranya terdapat sebarang kelangan/masalah yang boleh memberi kesan kepada komitmen terhadap proses rehabilitasi aurai yang dicadangkan.
- Saya bersetuju untuk menyerahkan komponen luaran (speech processor) beserta aksesorinya jika tidak digunakan lagi.

* Sila potong yang tidak berkenaan

Sekian Terima Kasih.

Yang Benar,

Disaksikan oleh,

(Pesakit/Waris)

(Pendaftaran & cop

)

Nama:

No. K/P:

* Sila berikan satu salinan untuk pesakit/waris

SURAT MAKLUMAN KEPUTUSAN MESYUARAT JAWATANKUASA TERAS PROGRAM IMPLAN KOKLEA KEMENTERIAN KESIHATAN MALAYSIA

NAMA PESAKIT _____

NO KAD PENGENALAN : _____

WARIS (IBU/BAPA) : _____

Sekiranya pesakit zamanur, disuruh 18 tahun

TARIKH _____

Saya _____ (pesakit/waris*) dengan ini memahami tentang penerangan yang telah diberikan oleh _____ (Pakar ORL/Pegawai Perubatan) tentang keputusan GAGAL dari Jawatankuasa Teras Koklea Implan Kementerian Kesihatan Malaysia yang telah bermesyuarat pada _____

Saya juga telah diberikan penjelasan penuh tentang aspek-aspek yang menyebabkan saya/anak saya bukan calon yang sesuai untuk menerima implan koklea melalui program di atas;

- Faktor- faktor perubatan (contohnya dari aspek radiologi atau kesihatan umum)
- Faktor-faktor klinikal, seperti keadaan Telinga/Hidung/Tekak
- Faktor Audiologi / Pertuturan
- Faktor Psikososial
- Komitmen terhadap program rehabilitasi aurai

Dengan ini sebagai proses rehabilitasi pendengaran dan pertuturan saya/anak akan disambung semula di Hospital _____

* Sila potong yang tidak berkenaan

Yang Benar,

Disaksikan oleh,

(Pesakit/Waris)

(Pendaftaran & cop

)

Nama:

No. K/P:

* Sila berikan satu salinan untuk pesakit/waris

7.2 Form for 3PK

CI INFORMATION EXCHANGE & RELEASE OF INFORMATION

This form has been designed to facilitate communication among the child's cochlear implant team, school personnel, early interventionists, if applicable, and private therapists. Please keep a copy of this form with child's records at each location. See CI Standard Operating Procedures for instructions.

When questions and/or concerns arise, please contact the relevant Staller Hospital immediately.

Date Form Completed: _____ Date Form to be Updated (1 year from completion date): _____

Child/Student Name: _____ Date of Birth: _____ Age: _____

Parent/Caregiver: Please ask your early interventionist or school to help you complete this form.

Parent Name/s: _____ Date of Birth: _____ Age: _____

Address: _____ Best way to communicate: phone / fax / email

SURGEON

Name: _____
Hospital: _____

Phone: _____
Fax: _____
email: _____

COCHLEAR IMPLANT SUPPORT TEAM

Name: _____
Hospital: _____

Phone: _____
Fax: _____
email: _____

SPEECH LANGUAGE PATHOLOGIST

Name: _____
Hospital: _____

Phone: _____
Fax: _____
email: _____

AUDILOGIST

Name: _____
Hospital: _____

Phone: _____
Fax: _____
email: _____

Therapist/Audiologist (As requested by family)

Organization: _____
Contact: _____
email: _____

Address: _____
Phone: _____
Fax: _____
Best way to communicate: phone / fax / email

School/Agency: _____ School/3PK State / Early Intervention Center
District of Residence: _____

Personnel responsible for completing CI Information Exchange & Release Form:

Name / Title: _____ email: _____

Address: _____ Phone: _____ Fax: _____ Best way to communicate: phone / fax / email

* Teacher: _____ email: _____

* Audiologist: _____ email: _____

* Speech Language Pathologist: _____ email: _____

* Intervention Specialist/Peripathetic: _____ email: _____

AUTHORIZATION TO RELEASE/RECEIVE INFORMATION

I grant permission for the names listed above to receive/exchange information (includes written and/or verbal communication) if needed to secure, coordinate and provide services to the individual listed above. This may include information regarding academic performance and health issues including emotional illness, drug or alcohol abuse, and HIV (AIDS/HIV) test results subject to the terms of federal law. This release is valid for one calendar year and will be updated at least annually. Reports may be sent and received ONLY to/from the sources listed above. When sources are added or deleted, it is necessary to complete a new form. To annually re-authorize the release of information as listed above, please sign below.

Parent/Guardian signature _____ Relationship _____ Date _____

*** The individual who assisted the family in completing this form and who routed a copy of this document to all of the above listed individuals: _____ (Name & Title) _____ (Date Form Routed)

BIBLIOGRAPHY

- Bill Daniels Center For Children's Hearing. (2008). Guidelines for Identification and Management of Infants and Young Children with Auditory Neuropathy Spectrum Disorder. Retrieved from <https://www.childrenscolorado.org/doctors-and-departments/departments/ears-nose-and-throat/clinics/daniels-center/ansd-guidelines/>
- Feirn, R., Sutton, G., Parker, G., Sirimanna, T., & Wood, S. (2013). *Guidelines for the Assessment and Management of Auditory Neuropathy Spectrum Disorder in Young Infants*. (pp. 344–354).
- Gibson, W. P. R., & Sanli, H. (2007). Auditory Neuropathy: An Update. *Ear and Hearing*, 28(2 Suppl), 102S–106S. <https://doi.org/10.1097/AUD.0b013e3180315392>
- Jeong, S.-W., & Kim, L.-S. (2013). Auditory Neuropathy Spectrum Disorder: Predictive Value Of Radiologic Studies And Electrophysiologic Tests On Cochlear Implant Outcomes And Its Radiologic Classification. *Acta Oto-Laryngologica*, 133(7), 714–721. <https://doi.org/10.3109/00016489.2013.776176>
- Johnstone, P. M., Yeager, K. R., & Noss, E. (2013). Spatial Hearing In A Child With Auditory Neuropathy Spectrum Disorder And Bilateral Cochlear Implants. *International Journal of Audiology*, 52(6), 400–8. <https://doi.org/10.3109/14992027.2013.779755>
- McMahon, C. M., Bate, K. M., Al-meqbel, A., & Patuzzi, R. B. (2010). Cochlear implantation in Auditory Neuropathy Spectrum Disorder. *Cdn.Intechopen.Com*, 31(3), 325–35. <https://doi.org/10.1097/AUD.0b013e3181ce693b>
- McMahon, C. M., Patuzzi, R. B., Gibson, W. P. R., & Sanli, H. (2008). Frequency-Specific Electrocochleography Indicates That Presynaptic And Postsynaptic Mechanisms Of Auditory Neuropathy Exist. *Ear and Hearing*, 29, 314–25. <https://doi.org/10.1097/AUD.0b013e3181662c2a>
- Neary, W., & Lightfoot, G. (2012). Auditory Neuropathy Spectrum Disorder: Examples Of Poor Progress Following Cochlear

- Implantation. *Audiological Medicine*, 10(3), 143–150. <https://doi.org/10.3109/1651386X.2012.707352>
- Sammeth, C. A., Bundy, S. M., & Miller, D. A. (2011). Bimodal Hearing or Bilateral Cochlear Implants: A Review of the Research Literature. *Seminars in Hearing*, 32(1), 3–31. <https://doi.org/http://dx.doi.org/10.1055/s-0031-1271945>.
- Vincent, C., Bébéar, J.-P., Radafy, E., Vaneecloo, F.-M., Ruzza, I., Lautissier, S., & Bordure, P. (2012). Bilateral Cochlear Implantation In Children: Localization And Hearing In Noise Benefits. *International Journal of Pediatric Otorhinolaryngology*, 76(6), 858–64. <https://doi.org/10.1016/j.ijporl.2012.02.059>
- Walker, E. A., Spratford, M., Moeller, P., & Oleson, J. (2013). Predictors of Hearing Aid Use Time in Children With Mild-to-Severe Hearing Loss. *Language, Speech, and Hearing Services in Schools*, 44(January), 73–88. [https://doi.org/10.1044/0161-1461\(2012/12-0005\)b](https://doi.org/10.1044/0161-1461(2012/12-0005)b)
- Walton, J., Gibson, W. P. R., Sanli, H., & Prelog, K. (2008). Predicting Cochlear Implant Outcomes In Children With Auditory Neuropathy. *Otology and Neurotology*, 29(3), 302–309. <https://doi.org/10.1097/MAO.0b013e318164dof6>.

DRAFTING COMMITTEE FOR COCHLEAR IMPLANT: SERVICE OPERATIONAL POLICY

ADVISOR

YBhg. Dato' Dr Siti Sabzah binti Mohd Hashim

Advisor, National MOH Cochlear Implant Programme,
National Advisor, Otorhinolaryngology Services, MOH

CHAIRMAN

YM Dr Tengku Mohammed Izam bin Tengku Kamalden

Chairman Of Cochlear Implant Programme
Hospital Sultan Ismail

CHAIRMAN OF DRAFTING COMMITTEE

Dr Fadzilah binti Ismail

ORL Specialist
Hospital Sg Buloh

SECRETARY

Pn Mas Diana binti Samsudin

Audiologist
Hospital Kuala Lumpur

FACILITATOR

Dr Patimah binti Amin

Head of Surgical & Emergency Unit
Medical Development Division, MOH

MEMBERS

Dr Philip Rajan

ORL Specialist

Hospital Raja Permaisuri Bainun

Dr Zulkiflee bin Salahuddin

ORL Specialist

Hospital Raja Perempuan Zainab II

Dr Iskandar bin Hailani

ORL Specialist

Hospital Kuala Lumpur

Dr Irene Cheah Guat Sim

Neonatalogist (Consultant)

Pediatric Institute, GHKL

Dr Noryati binti Mohammad

Radiologist (Consultant)

Pediatric Institute, GHKL

Pn Nur Azyani binti Amri

Audiologist

Hospital Sg Buloh

Pn Yuzaida binti Md Yusoff

Audiologist

Hospital Sultanah Bahiyah

Pn Farah Dalila binti Mohd Tahir

Audiologist

Hospital Sultanah Bahiyah

Pn Norhana binti Seman@ Talib

Speech-Language Therapist
Hospital Sultanah Bahiyah

Pn Noormala binti Anuar Ali

Speech-Language Therapist
Hospital Shah Alam

Pn Lina Azlina binti Alias

Occupational Therapist
Hospital Kuala Lumpur

En Khairul Naim bin Azis

Medical Social Officer
Hospital Kuala Lumpur

En Khairul Anuar bin Jamil

Pusat Perkhidmatan Pendidikan Khas (3PK)
Ministry of Education

the 1990s, the number of publications on the topic has increased steadily, and the number of authors has increased from 1 to 100.

There are a number of reasons for the increase in research on the topic. One reason is the growing awareness of the importance of the topic. Another reason is the increasing availability of data and methods for studying the topic. A third reason is the increasing interest in the topic by the general public.

The first reason is the growing awareness of the importance of the topic. In the 1990s, there was a growing awareness of the importance of the topic. This was due to the fact that the topic was becoming more and more relevant to the general public. As a result, there was a growing interest in the topic by the general public.

The second reason is the increasing availability of data and methods for studying the topic. In the 1990s, there was a growing availability of data and methods for studying the topic. This was due to the fact that there were now more and more people who were interested in the topic. As a result, there was a growing interest in the topic by the general public.

The third reason is the increasing interest in the topic by the general public. In the 1990s, there was a growing interest in the topic by the general public. This was due to the fact that the topic was becoming more and more relevant to the general public. As a result, there was a growing interest in the topic by the general public.

The fourth reason is the increasing interest in the topic by the general public. In the 1990s, there was a growing interest in the topic by the general public. This was due to the fact that the topic was becoming more and more relevant to the general public. As a result, there was a growing interest in the topic by the general public.

The fifth reason is the increasing interest in the topic by the general public. In the 1990s, there was a growing interest in the topic by the general public. This was due to the fact that the topic was becoming more and more relevant to the general public. As a result, there was a growing interest in the topic by the general public.

The sixth reason is the increasing interest in the topic by the general public. In the 1990s, there was a growing interest in the topic by the general public. This was due to the fact that the topic was becoming more and more relevant to the general public. As a result, there was a growing interest in the topic by the general public.

The seventh reason is the increasing interest in the topic by the general public. In the 1990s, there was a growing interest in the topic by the general public. This was due to the fact that the topic was becoming more and more relevant to the general public. As a result, there was a growing interest in the topic by the general public.

The eighth reason is the increasing interest in the topic by the general public. In the 1990s, there was a growing interest in the topic by the general public. This was due to the fact that the topic was becoming more and more relevant to the general public. As a result, there was a growing interest in the topic by the general public.