



# INFANT HEARING PROGRAM

## Hearing Instrument Dispensing Protocol and Training Manual

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# **INFANT HEARING PROGRAM DISPENSING TRAINING PROTOCOL**

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## **INFANT HEARING SCREENING AND COMMUNICATION DEVELOPMENT PROGRAM: OVERVIEW**

### **INTRODUCTION**

The Infant Hearing Screening and Communication Development Program (Infant Hearing Program) was announced in the Ontario Government's 2000 Budget. This Program builds on the previously introduced government programs designed to give children a better start in life, including the Preschool Speech and Language Initiative.

This document provides an addendum to guidelines developed to assist in the local implementation of the Infant Hearing Program across Ontario. A province wide standard will ensure that infants born deaf or hard of hearing or at risk of developing hearing loss in early childhood will be identified and that access to the necessary services and supports will be available to these babies and their families.

### **CONTEXT**

The importance of acquiring communication skills early in life is well understood. Research has shown that delay in language development can have significant impact on cognitive, emotional and psychosocial development and that language development is a prime indicator of future academic success. Children born with permanent hearing loss or who acquire permanent hearing loss during the early years of life are at risk for delay in language development, if identification and mediation are not initiated early. Further, it is well understood that the earlier the hearing loss is identified, and supports and services for communication development are provided, the better the acquisition of language skills.

Screening of newborns to detect permanent hearing loss has been advocated for many years. In Ontario screening of infants at high risk for hearing loss has been provided in some hospitals, but these services have reached only a small number of the 140,000 babies born in the province each year. The average age of identification of hearing loss in young children has remained about 2 ½ years of age in Ontario (Durieux-Smith & Whittingham, 2000), while the recommended maximum age is 6 months (JCIH, 2000).

### **VISION**

Children who are born deaf or hard-of-hearing or at risk for developing hearing loss in early childhood will be identified and will be offered services and supports to assist them and their families in the development of communication. According to the choices made by the family, children identified as deaf or hard of hearing will be assisted in the acquisition of the communication skills needed for performance of daily activities and for personal and social sufficiency at home and at school.

### **GOALS OF THE PROGRAM**

The goals of the program are to provide an integrated system of services in all parts of Ontario that will:

1. identify infants born deaf or hard of hearing or at risk for developing hearing loss in early childhood and
2. provide child and family centered services to support communication development.

## **PRINCIPLES**

1. There will be access to the services of this program across Ontario
2. Every aspect of this program will be provided based on fully informed parent/guardian choice and consent, and will comply with confidentiality requirements.
3. All services will be child and family centered taking into consideration the cultural and ethnic diversity of the people of Ontario.
4. A seamless system of services will be developed that integrates this program with other existing children's programs and services.
5. The components of this program will be developed using the principles of evidence based practice.
6. The program will be monitored and evaluated on an ongoing basis.
7. The quality of the program will be continuously improved based on the evaluations.

## **THE PROGRAM**

The Infant Hearing Screening and Communication Development Program (Infant Hearing Program) has three major components.

1. Universal Hearing Screening
2. Hearing Loss Confirmation and Audiologic Assessment
3. Follow up Support and Services

Training is provided for individuals who are involved in the delivery of all aspects of the program. Detailed protocols have been developed and will be followed for delivery of all components of the Program. These protocols will be reviewed and changed as required to reflect current evidence based practice.

The Program is administered through the infrastructure of the Preschool Speech and Language Initiative (PSL) using 12 Coordinating PSL Systems to coordinate local service delivery.

## **PROGRAM COMPONENTS**

### (1). Universal Newborn Hearing Screening

The hearing screening component of this program is designed, in keeping with the most current evidence, to achieve as low a false positive rate as possible, ideally less than 4%. It is expected that the model will constantly change over time as new evidence provides information of improved techniques and methodology.

As planned there are 3 approaches to the Universal Screening:

- 1) HOSPITAL PREDISCHARGE WELL BABY SCREENING
- 2) HOSPITAL PREDISCHARGE HIGH RISK BABY (NICU) SCREENING
- 3) COMMUNITY SCREENING AND HIGH RISK MONITORING

1) HOSPITAL PREDISCHARGE WELL BABY SCREENING

The mothers of all newborns who do not have any known risk factors for congenital hearing loss will be offered a hearing screening for their baby prior to discharge from the hospital birth admission.

In keeping with the most recent evidence the "Well Baby Screening" will be a 2 stage process.

i). STAGE 1 The Stage 1 process consists of 2 parts, babies who receive a "refer" result from part 1 will have the second part of the screening. Part 1 of the Well Baby Screening will be done using Automated Distortion Product Otoacoustic Emissions (ADPOAE) technology. Babies with a "refer" result from the DPOAE, should have the second part of the Stage 1 process, which is a screening using Automated Auditory Brainstem Response (AABR). Ideally this will occur before the baby is discharged from hospital.

ii). STAGE 2 Every well baby with a "refer" result from the predischarge screening will receive another screen using the Automated Auditory Brainstem Response (AABR) technology. Ideally this Stage 2 screening will be arranged after 2 to 3 weeks to allow time for the resolution of any middle ear disease that may cause a false positive result. Babies with a "refer" result from Stage 2 screening will then receive an audiological assessment for confirmation of hearing loss.

2) HOSPITAL PREDISCHARGE HIGH RISK BABY (NICU) SCREENING

Any baby with risk factors for congenital hearing loss will be screened using Automated Auditory Brainstem Response (AABR) technology. This screening is a 1 Stage process. Babies with a "refer" result from this screening will go directly for audiologic assessment.

Many babies who spend time in the NICU have risk factors for progressive or early-onset hearing loss. Therefore, even if these babies pass the Stage 1 screening procedure, they will be followed through repeat Stage 1 ADPOAE screenings until they are 3 years of age.

3) COMMUNITY SCREENING

Regularly scheduled screening clinics will be offered in community locations throughout each of the 12 regions to provide screening to babies who missed the hospital predischarge screening.

These clinics will also be used to provide the Stage 2 screening for those babies who had a "refer" result from Stage 1.

(2). Hearing loss confirmation and audiological assessment

All babies who receive a "refer" result from the screening will be sent to an audiologist for assessment. The system is designed so that a completed audiological assessment is performed between 8 and 12 weeks of age. Evidence based protocol for audiological assessment of infants has been developed through a consultation process with a representative group of provincial audiologists. The protocol will be reviewed and updated on a regular basis to ensure the procedures are consistent with current evidence based practice. The results of the audiological assessment will be explained to parents by the audiologist and the appropriate referrals initiated, if indicated. All audiologists and agencies employing audiologists must agree to use the specified equipment, perform the

assessment protocol as described, adhere to the Infant Hearing Program counseling principles, and provide the test results to the local coordinating PSL System.

#### Medical Referral and Management

All babies with a confirmed hearing loss must be referred to an otolaryngologist, preferably with pediatric experience, for assessment and medical management if it is indicated. For those babies who are candidates for amplification, it is a requirement of the Assistive Devices Program that an otolaryngologist assess the child, confirm the absence of contraindications to non-medical intervention and sign the forms.

### (3). Follow up support and services

#### A. Family Support and Access to Information

It is the policy of the Infant Hearing Program that parents of babies identified as deaf or hard of hearing will have access to unbiased information on all approaches for communication available to their child. It will be the decision of the parents as to what communication approach their child will use and it will be a fully informed choice.

Parents will be provided with counseling and support as they adjust to the knowledge that their child is deaf or hard of hearing and go through the decision making process to choose a communication approach. They will be provided with information on all communication approaches and on the various stakeholders that represent the different philosophies.

#### B. Technology

##### (a) Hearing Aid Selection and Verification

All babies with a confirmed permanent hearing loss, whose parents have chosen assistive technology, will be seen by an audiologist for hearing aid selection and verification. Evidence based protocol for hearing aid selection and fitting in infants has been developed through a consultation process with a representative group of provincial audiologists. The protocol includes development of a detailed hearing aid prescription based primarily on data obtained in the audiologic assessment, and the verification that the prescriptive targets have actually been achieved in subsequent device fitting. Audiologists who are providing this service have completed training on the protocol. The protocol must be followed in choosing and fitting hearing aids for a baby as part of this program. The protocol will be reviewed and updated on a regular basis to ensure the procedures are based on current evidence based practice. All audiologists and agencies employing audiologists must agree to use the specified equipment, perform the selection and verification protocols as described, and provide appropriate documentation to the Coordinating PSL System.

Only audiologists who are registered prescribers with the Assistive Devices Program will be permitted to prescribe hearing aids for babies in this program.

##### (b) Hearing Aid Dispensing

A protocol for the dispensing of hearing aids for an infant has been developed through a consultation process with hearing aid dispensers, including dispensing

audiologists, who have expertise in fitting infants. The protocol must be followed when fitting hearing aids on a baby. Dispensers who wish to provide this service will complete the training on the protocol. The protocol will be reviewed and updated on a regular basis to ensure the procedures are based on current evidence based practice.

Only individuals who are registered dispensers with the Assistive Devices Program will be permitted to dispense hearing aids to babies in this program.

(c) Other Assistive Technology

Some babies, whose parents have chosen the option, may be candidates for assistive listening devices other than personally worn hearing aids. If the audiologist determines that the infant would benefit from other assistive technology, such as FM systems, cochlear implant, or Bone Anchored Hearing Aid, the audiologist will provide the prescription to the parents or a referral to an agency that provides the service as soon as is appropriate.

C. Communication Development

As soon as the family has chosen an approach for communication with their baby, any support or services that may be required to assist the baby in learning language will be provided. Hearing parents who have chosen to communicate with their baby using sign language as a first language will be given the opportunity to access sign language instruction. Those families who choose to use oral language with their baby will have access to auditory-verbal therapy or auditory/oral therapy. Services will be provided for the aforementioned approaches through the child's local PSL System or by other agencies or individuals as determined by each regional plan. The goal will be to provide access as close to the child's home as reasonably possible.

**PROGRAM OBJECTIVES**

- 1) A minimum of 95% of the target population will receive timely and appropriate screening
- 2) All babies accessed will have received a successful (two-stage) screening by 2 months corrected age or within 2 months of discharge from an NICU.
- 3) The referral rate for audiologic evaluation will be no more than 5% within 1 year and 4% or less within the 2<sup>nd</sup> year after program initiation.
- 4) At least 90% of babies who have a screening result of "refer" will receive an audiologic assessment.
- 5) The audiologic assessment will occur no earlier than 2 months corrected age, but no later than 4 months.
- 6) Infants with a confirmed hearing loss will begin use of amplification, when appropriate and chosen by the family, within 2 months of confirmation of the hearing loss, but no earlier than 3 months of age and no later than 6 months of age, wherever possible.
- 7) Infants with a confirmed hearing loss will access the services to support communication development chosen by the family within 2 months of confirmation of the hearing loss, but no later than 6 months of age.

## **PROGAM EVALUATION**

The Infant Hearing Program will be evaluated on an ongoing annual basis. In the first 2 years the evaluation will focus on administrative objectives and process outcomes. Following complete implementation of the program, child performance outcomes will be developed and the program will be evaluated based on those indicators.

A quality assurance process is under development for service providers and several mechanisms of ongoing operational support are under consideration. These may include web-based information and educational resources, case-conferencing, internet, fax or phone consultations for discussion of results and outcomes and for other clinical support issues. Seminars, updates and other traditional avenues for continuing education are also under consideration.

The clinical support mechanisms will complement other aspects of program quality management which may include client satisfaction survey, case review, random audits of clinical records and/or site visits. These procedures are now widely recognized as appropriate in the quality management of medical and allied health services delivery. Regional and provincial procedures to ensure service quality will be implemented on an ongoing basis.

## **OVERVIEW OF THE PRESCRIPTIVE PROCESS**

This section describes the prescription of amplification for infants registered in the Ontario Infant Hearing Program (IHP). Most infants requiring amplification will have been identified with the IHP target permanent childhood hearing impairment (PCHI) through universal newborn hearing screening. These infants will typically have received audiologic Assessment within the first four months. A minority will have been identified by repeat screening of at-risk infants or by other referral routes, and will have received Assessment at any point in the first two years. See the document 'Audiologic Assessment Protocol and Guidelines' for the details and rationale of the IHP Assessment protocol.

'Prescription' as defined in IHP documentation includes the process of selecting a hearing aid, verification that the specified acoustical performance targets have been achieved, and validation of device effectiveness in daily life. The prescription shall include a specification of the type of hearing aid(s) to be fitted, appropriate settings and applications that will result in an amplification system that addresses the needs of the individual infant and family.

All IHP Prescription must be conducted by an audiologist registered with the College of Audiologists and Speech-Language Pathologists of Ontario (CASLPO). Audiologists who provide amplification to infants under the IHP have attended training on the IHP Protocol.

If amplification is indicated based on audiometric data, and is elected by the family after review of the options and information, and if absence of specific contraindications is confirmed by an otolaryngologist, prescription shall be undertaken in a timely manner. The IHP supports provision of amplification under six months of age, wherever feasible.

### **Candidacy and Timing for Prescription of Amplification**

For an infant to be considered a candidate for amplification, a hearing impairment shall have been identified by IHP Audiologic Assessment. The determination that amplification should be recommended on audiologic grounds is at the discretion of the IHP audiologist. The rationale for any recommendation that amplification should or should not be considered by the family shall be fully documented.

The entire process of selection, ordering, supplying, fitting and verification of the hearing aids, and accounting for scheduling of appointments, earmold impressions and hearing aid adjustments and various other possible delays, may take two months or more. The IHP interpretation of the JCIH recommendation is not just fitting hearing aids at six months but a completed process of fitting, verification and adjustment, if necessary, by six months. From these considerations, it is anticipated that the majority of IHP Prescription activities will occur in infants aged about 4-6 months.

### **Prescribing Amplification**

The immediate goal of Prescription is to perceive sound. Published reports suggest that early improvement in auditory perception can facilitate the development of sensory and perceptual skills, receptive and expressive language, speech production

and literacy, academic performance and social-emotional growth (Carney & Moeller, 1998).

The specific objectives of prescribing amplification are:

1. To provide an amplified speech signal that is consistently audible
2. To avoid distortion of varying inputs at prescribed settings for the user
3. To ensure the signal is amplifying sounds in as broad a frequency range as required
4. To include sufficient electroacoustic flexibility to allow for changes in the required frequency/output characteristics related to ear growth or changes in the auditory characteristics of the infant

The components necessary in the determination of the amplification prescription are:

1. a complete description of the infant's auditory characteristics for both ears (obtained during the audiologic assessment phase of the IHP)
2. a description of the acoustic characteristics of the infant's ear canal leading to a prescription for an earmold(s)
3. an assessment of the non-electroacoustic needs of the infant
4. the target ear canal sound pressure levels (SPL) for the amplified long-term average speech spectrum consistent with electroacoustic selection procedures to be applied
5. the target ear canal SPLs for defining the maximum saturation response (RESR) of the hearing aid
6. valid procedures for verifying the electroacoustic characteristics of the hearing aid

#### Determining Auditory Characteristics

(See IHP Audiologic Assessment Protocol for details)

Wherever feasible and indicated, complete audiometric Assessment of the young infant shall include the following:

- (i) Physiologically based estimation of frequency-specific and ear-specific hearing thresholds. Currently, this shall be done using tonepip ABR methods, including bone-conduction measurements,
- (ii) Objective measurement of cochlear function, currently including DPOAEs as well as cochlear microphonic (CM) potentials,
- (iii) Objective middle-ear analysis (MEA), currently including acoustic immittance measurement (tympanometry, with low- and high-frequency probe tones), and middle-ear muscle reflexes (MEMR, ipsilateral, with a high-frequency probe tone),
- (iv) Objective measurement of the functional status of auditory brainstem pathway, currently including otoneurologic click ABR, and
- (v) Developmentally appropriate measurement of behavioural response to sound, preferably frequency-specific and ear-specific, by VRA wherever applicable.

#### Determining Acoustic Characteristics of the Infant's Ear Canal

(See IHP Amplification Protocol for details)

The Real-Ear-to-Coupler Difference (RECD) measurement procedure was developed to determine an individualized acoustic transform for use with the Desired Sensation Level (DSL®) Method (Moodie et al., 1994; Seewald, 1995). The individual's RECD is used to generate the appropriate gain and output response for a hearing instrument, and has been shown to be highly repeatable and valid (Munro & Hatton, 2000;

Sinclair et al., 1996; Seewald et al., 1999). Therefore, it is a required element in the prescription of amplification for infants involved in the IHP.

#### Determining Non-electroacoustic Characteristics

The style of the hearing aids will affect many aspects of the hearing aid fitting for an infant. Behind-the-ear (BTE) hearing aids are most appropriate for infants for the following reasons:

- 1) Rapid growth of the infant's outer ear can result in acoustic feedback due to loosely fitting earmolds. Changes in the ear necessitate the fabrication of new earmolds frequently.
- 2) Softer earmold material compared with custom hearing aid shell material allows for better retention and for protection of the ear from harm during play, etc.
- 3) Custom fitted hearing aids are generally more prone to feedback because of the closer proximity between microphone and receiver compared to the BTE style. When feedback is present, parents/caregivers attempt to reduce it by decreasing the volume of the hearing aids, which compromises the audibility of the speech signal.
- 4) BTE hearing aids have the potential for greater electroacoustic flexibility.
- 5) The Direct Audio Input capabilities of the BTE style is more compatible with the target population than the teleloop/silhouette coupling option of custom styles.
- 6) BTE hearing aids have greater durability than custom fitted hearing aids.
- 7) If a BTE aid needs to be sent to the manufacturer for repair, a similar aid can be coupled to the infant's personal earmolds while the hearing aid is under repair.

#### Determining Electroacoustic Characteristics

The use of a systematic, objective approach to electroacoustic selection that incorporates age-dependent variables into the computations for selecting a hearing aid is required. The formula that will be used to develop the appropriate electroacoustic characteristics for each infant involved in the IHP is the Desired Sensation Level<sup>®</sup> Method.

Appropriate electroacoustic characteristics of the hearing aids may include both linear (with output compression) and nonlinear processing in either an analog or digital format. Advanced signal processing schemes (automatic feedback suppression, expansion, multiple channels, noise reduction and speech enhancement algorithms) should be considered viable in pediatric hearing instrument fittings until such time as sufficient research data exists to exclude them. These advanced signal-processing strategies should be assessed for each infant on an individual basis.

#### **Verification**

When the prescription is complete and the electroacoustic and non-electroacoustic characteristics of the potential hearing aids have been identified, the prescribing audiologist selects the hearing aids that will meet the criteria. When the hearing instruments have been ordered, evidence-based verification of the selected amplification parameters must be completed prior to the infant wearing the devices. (See IHP Amplification Protocol for details of hearing aid verification).

## **THE DISPENSING PROTOCOL**

### **1. Role of Service Providers**

In this protocol, the IHP prescribing audiologist is recognized as the service provider with responsibility for the management of amplification needs and the audiologic aspects of communication development. Therefore, all elements of the amplification prescription will be determined by the prescribing audiologist and no departures will be made without their prior approval. Communication and collaboration between the prescribing audiologist and the hearing aid dispenser is therefore critical to ensure that current and accurate information is available prior to any services covered in this document being provided. As concerns arise regarding amplification tolerance, audibility or appropriateness of the fitting, the prescriber should be notified and arrangements made for re-evaluation and for modification of the prescription as necessary.

#### **Professional Practice**

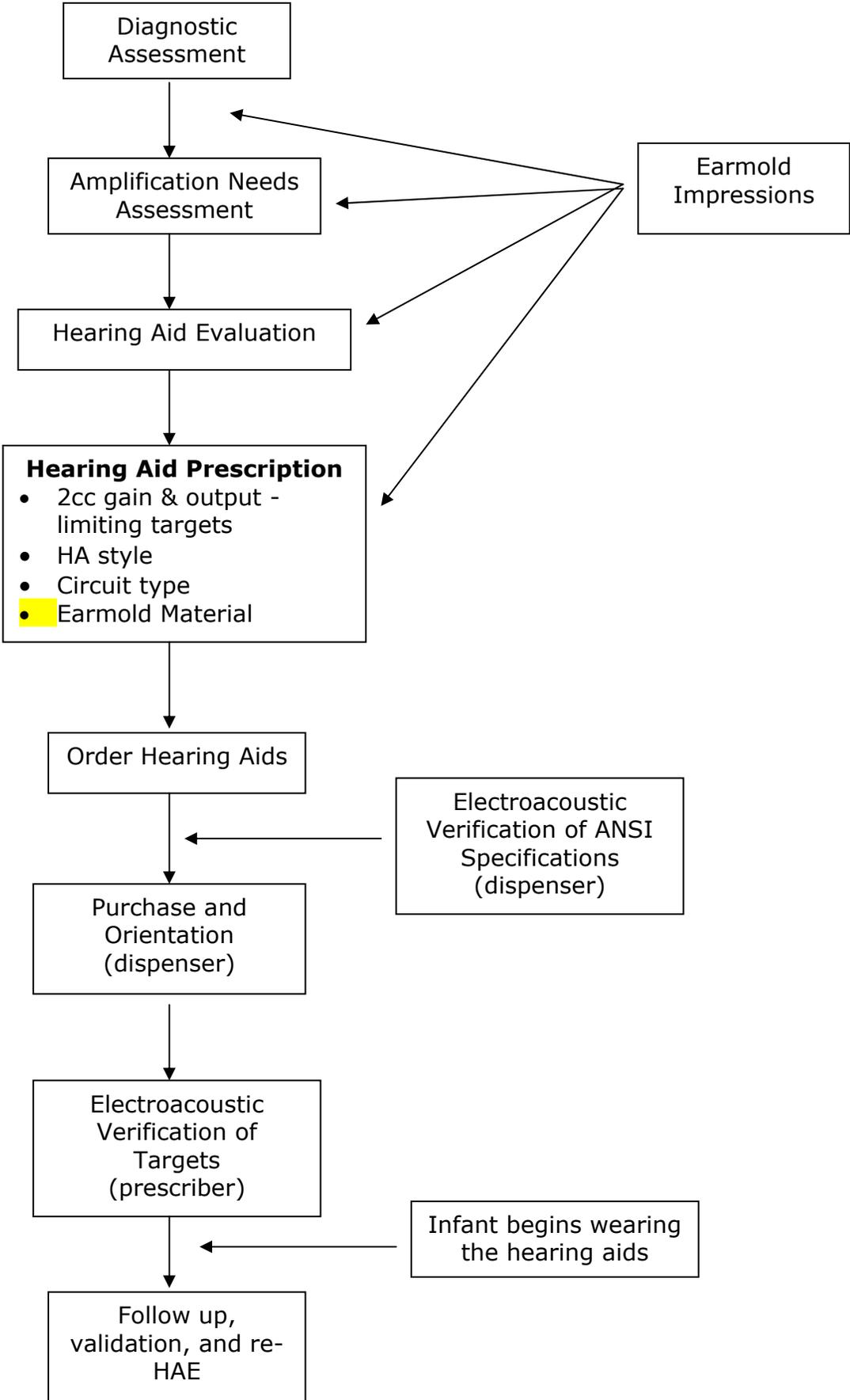
Should this protocol and any professional practice guideline issued by CASLPO be perceived as in conflict, the CASLPO standard shall apply and the IHP should be notified promptly. Where this protocol is more specific than any available CASLPO standard, or where no such CASLPO standard exists, this protocol shall apply.

The Principles of the Infant Hearing Program shall apply in all communication and contact with families as well as between service providers. All service providers in circumstances in which the Infant Hearing Program is represented will follow the Code of Ethics of their relevant professional college or association.

#### **Compliance**

The IHP recognizes that individual infants may require specific approaches and procedures that depart from this protocol to a varying degree. Such decisions shall be based on special or exceptional circumstances and are at the discretion of the individual IHP prescribing audiologist. Rationale for these departures shall be documented and the IHP may seek to review such documentation and clinical records, in individual cases.

**ELEMENTS OF THE AMPLIFICATION PROCESS**



## ROLE OF PRESCRIBING AUDIOLOGIST VS. DISPENSER

PRESCRIBER	DISPENSER
Amplification Needs Assessment (Prescription for Earmold)	(Ear Impressions)
Hearing Aid Evaluation – RECD, amplification needs with respect to diagnostic assessment	
Prescription for hearing aids (and earmolds)	(Ear Impressions)
	Order aids as per prescription
	Receive aids from manufacturer
	Test aids (ANSI) in hearing aid analyzer
Verification and fitting – RECD measures with custom earmolds, program aid, perform electroacoustic verification, check earmold fit and characteristics	
	Vend aids, earmold, batteries Check earmold fit
	Dispense parents’ kit, care and maintenance instruction, tips for use, warranty, etc.
	Modify/ remake earmolds
	Hearing aid repair – upon return: ANSI test, reprogram according to most recent prescription from the audiologist
3 month f/u HAE – hrg test, RECD measures, reprogram – inform dispenser of changes so they have most current prescription and earmold requirements	

The IHP recommends that the prescribing audiologist verify that the electroacoustic performance of the hearing aids meet the prescription requirements before the child uses the aids. This requirement is more specific than the ADP guidelines, which state that the audiologist should verify performance prior to the end of the hearing aid trial period. The IHP requirements represent a standard of best clinical practice and a high quality of care for the child, in addition to meeting the ADP guidelines for the protection of the consumer.

## **2. Earmold Impressions (See Appendix A for Procedure)**

Ear impressions will be obtained from each ear for fabrication of personal earmolds (see Appendix A) as per the earmold prescription. The prescription should include length of canal and helix, material (silicone, etc.), tubing type, shell style, vent (if possible) and options. Some earmold modifications will be limited by the size of the infant's ear, and any difficulty meeting the requirements of the prescription should be referred back to the prescribing audiologist.

The infant's earmolds should be made of a soft material for comfort, safety and retention. Also, softer material reduces the possibility of acoustic feedback from the hearing aid. The advantages and disadvantages of various earmold materials should be weighed for each individual infant (See Appendix A for details).

The need for frequent replacement of earmolds to prevent acoustic feedback should be explained to the parent/caregiver.

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## **3. Setting/ Programming To Targets (See Appendix B for Procedure with Audioscan RM500)**

### **ANSI Test**

Upon receipt of the hearing aids from the manufacturer, the dispenser shall proceed with an electroacoustic analysis of the hearing aids (ANSI Test) to confirm that the hearing aids are functioning according to the manufacturer specifications.

Any departure from the specification of gain, output, or distortion at any frequency beyond acceptable tolerances should be reported back to the manufacturer and the hearing aid returned for repair or remake as appropriate.

A biological listening check should also be performed to subjectively evaluate sound quality and physical function of components.

### **Fitting Hearing Aids to Targets**

The hearing aid settings shall be adjusted according to the most recent prescription and hearing aid settings provided by the prescribing audiologist. Included in the prescription will be the electroacoustic targets for gain and maximum output developed using the child's most recent hearing test results and RECD measurements. For infants, the required approach is one in which the shaping of the electroacoustic response of the hearing aids is performed in accordance with the prescribed targets in a highly controlled hearing aid test box environment.

Following the receipt and fitting of the infant's personal earmolds and the setting of the hearing aids to the prescribed targets, the infant will return to the prescribing audiologist where electroacoustic verification will be performed prior to the infant wearing the devices.

As the infant's external ear canal grows, the acoustic properties of the ear will change substantially, especially in the first year of life. This change in ear size will necessitate replacement earmolds on a frequent basis. Whenever a new earmold is made, an RECD measurement shall be obtained to incorporate changes in ear canal acoustics, and applied to the existing prescription of the hearing aid. RECD measurements will be obtained at each follow-up hearing aid evaluation as part of

the verification procedures described in the IHP Amplification Protocol document and the prescription will be updated accordingly.

The dispenser will incorporate changes to the prescription for the purposes of device setting as advised by the prescribing audiologist, and will use the *most current prescription* to verify a device when it returns from manufacturer repair or when earmolds are changed. The dispenser will inform the prescriber of changes in earmold specifications, or occurrence of repair between visits to insure that the prescription is updated accordingly. Regular communication between the prescribing audiologist and dispenser is therefore critical.

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#### **4. Parent Orientation (See Appendix C for Checklist)**

Giving necessary information and instruction to the family/caregiver is a critical part of providing amplification to an infant. Explanations of use, care and maintenance of the devices should be provided in an understandable way and preferably supplemented by appropriate, printed materials. A care and maintenance kit for parents or caregivers is usually helpful. Intensive family involvement is required to ensure that hearing aids are worn correctly, are functioning appropriately and are maintained sufficiently for optimal hearing aid benefit.

Supportive information and instruction for the family/caregiver shall be provided at the time of the first fitting of the hearing aids, and at follow-up visits. Information may need to be repeated or reiterated until the family/caregiver becomes more familiar with the hearing aids and the implications of the child's hearing loss.

Despite their decision to proceed with amplification, families may continue to need various supports to help them through the process of acceptance of the hearing loss and commitment to an approach for habilitation. Support is available through the local IHP family support worker or the IHP audiologists, and interdisciplinary referral should be made when concerns or issues arise which are outside the scope of practice of the Infant Hearing Program Dispensing Protocol. In addition, interdisciplinary collaboration during the assessment and prescription process is beneficial, especially when the child's case is complex or the family's adjustment process is atypical. Further information on support services can be found in the IHP Local Implementation Support Document.

The dispenser will ensure that the following care and maintenance techniques are demonstrated to the parent or caregiver during the initial hearing aid orientation:

- *Demonstration* of earmold insertion, including use of oto-ease and other practical fitting suggestions, such as putting the hearing aids on, etc.
- Hands-on demonstration and practice of earmold insertion, tubing attachment to hearing aid, insertion of batteries, etc.
- *Demonstration* of a daily inspection of ear canal, and daily listening check of the hearing aids. The listening check should include adjustment of controls, Ling 6 Sounds Check, etc.
- Discussion and *demonstration* of troubleshooting techniques and solutions.
- *Demonstration* of equipment found in the care and maintenance kit – battery tester, earmold blower, stethoscope, dri-aid kit, etc.
- Discussion of retention techniques – demonstration of critter clips, double-sided tape, huggie-aids, etc.

A complete list of discussion topics for clinicians and families is included in Appendix C.

The dispenser will also provide written information from the manufacturer for parents to take home and refer to, and other appropriate Infant Hearing Program pamphlets and information.

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## **5. Information and Follow Up**

In any communication with families, the principles of the IHP should be reflected. Only evidence-based information should be imparted. Anecdotal information and personal opinions are **not** considered appropriate content for communication with parents. Service providers are encouraged to impart unbiased information in their area of expertise. Interdisciplinary referrals should be made when appropriate as questions arise which are outside of the prescriber's/dispenser's scope of practice such as prognosis, medical or audiological issues, or communication development.

The roles and scopes of practice for service providers within the Infant Hearing Program are clearly defined and are detailed in each of the service delivery protocols. For dispensers, discussion with families shall focus on topics covered in this protocol document. Questions or concerns that arise regarding the infant's performance or formal assessment of hearing aid benefit should be referred to the prescribing audiologist. Issues such as language acquisition, communication development approaches or psychological support should be referred to the Infant Hearing Program Family Support Worker or the Infant Hearing Program Coordinator.

Families shall have access to interdisciplinary information directly from the service provider for whom the information falls within their scope of practice and shall be referred between and among providers as is appropriate.

### **Schedule**

Follow up to the initial hearing aid fitting should be accomplished on a regular schedule, with accommodation for individual needs. It is recommended that the dispenser plan *a minimum number of 2 follow up visits within the trial period* which is recommended to be a minimum of 60 days.

Follow up visits are recommended following the end of the trial period at *no less than 3 month intervals for the first year*, and every 6 months thereafter. A complementary follow-up schedule has been established for the prescribing audiologist, so regular communication and coordination will provide seamless and efficient service for the family.

At the follow-up visits, the dispenser should meet with the parent/caregiver to discuss use, care and maintenance of the hearing aids as parents' questions arise, or as re-instruction is required. The fit of the earmolds should be checked, and modifications made as necessary.

## APPENDIX A

### **Procedure for Obtaining an Earmold Impression**

#### **Recommended Materials**

- silicone-based earmold impression material
- 2 measuring scoops
- impression syringe – pediatric tip
- oto-blocks
- earlight
- otoscope with pediatric specula
- mixing spatula
- non-stick mixing pad
- non-latex plastic gloves

#### **Procedure**

- 1) Instruct parent re: positioning, and child control
- 2) Wear a clean pair of non-latex plastic gloves throughout the entire procedure (or follow your clinic's specified infection control guidelines).
- 2) Perform an otoscopic examination to ensure that there are no conditions that would preclude taking an earmold impression (e.g. discharge from the ear, excessive cerumen). Make an estimate of ear canal size and length.
- 3) Measure and mark earlight using the following general guidelines:
  - <6 months – mark earlight for approximately 10 mm from ear canal entrance
  - >6 months – mark earlight for 10-15 mm from ear canal entrance, depending on ear size and age.

Note: If infant is premature, has Down's syndrome, low birth weight, etc., insertion depth may need to be reduced.
- 4) Using the earlight, insert the oto-block gently into the ear canal so that the marked position on the earlight is at the ear canal entrance (see #3 above). Examine the depth and position of the oto-block with the otoscope. When satisfied with the placement, wrap the string from the block over and around the infant's ear.
- 5) Measure the appropriate amount of earmold impression material as indicated on the container. Mix the material together as directed. Place the material in the syringe and insert the plunger forcing the material down the syringe.
- 6) Place the tip of the syringe down the ear canal as close to the otoblock as possible. Do not pull on the patient's ear, as this will change the shape of the ear canal.
- 7) Depress the plunger slowly and move the syringe out as the canal fills. Keep the tip of the syringe in the impression material at all times. Once the canal is full, move out into the concha, filling in as much as possible without removing the syringe from the impression material. Next, fill in the helix area and then the rest of the concha. Gently press on the tragus to ensure that this area is not overfilled.

- 8) Employ techniques to encourage jaw movement while filling the canal e.g. sucking or other mouth movement. Movement need not continue throughout the hardening process.
- 9) Allow the impression material to harden; approximately 5 to 10 minutes. If you push your fingernail on the material without leaving an indentation, then the material is set.
- 10) To remove the impression, pull gently on the pinna to loosen the impression in the infant's ear. Then, carefully peel out the concha portion without bending the canal; at the same time remove the helix portion. When the concha portion is about a third of the way out, gently rotate the impression forward (towards the patient's nose) and remove the canal portion of the impression.
- 11) Perform an otoscopic inspection of the ear canal to ensure removal of the otoblock and earmold material, and to evaluate the status of the ear canal.
- 12) Inspect the impression for quality and completeness
- 13) Mark the canal for appropriate length.

### **Earmold Material and Style**

Although earmold labs have a variety of brand names for their products, 2 main choices of pliable earmold material should be considered for children: PVC (vinyl) or Silicone.

For very young children (<12 months), the size of the ear canal may limit the diameter of the sound bore and how completely the earmold can be tubed. If the earmold material is too pliable, a small ear canal could constrict or close off the un-tubed portion of the sound bore.

Silicone materials do not accept glue and usually require the use of a tube lock or tubing retention ring to hold tubing in place. This can distort the shape of the earmold in small ear canals, causing irritation or even feedback. PVC (vinyl) material accepts tubing glue and is somewhat stiffer in shape than silicone; therefore it is preferable for children under 6 months of age, or for children with unusually small ear canals.

Earmold venting should be considered with caution. The primary fitting problem with infants and young children is feedback. A vented earmold can be an additional source of feedback. The size of an infant's ear canal will often limit the ability to add a vent. If venting is possible, it is diagonal, rather than parallel venting and tubing retention again will be affected.

Shell-style earmolds are the standard style recommended for children, because of retention and feedback-prevention. Helix locks may improve earmold retention, but parents should be carefully instructed on inserting them correctly to prevent irritation or feedback from a helix lock that is not placed properly.

## APPENDIX B

### Running an ANSI Test on the Audioscan RM500

After appropriate calibration of the RM500, ensure that the hearing aid is coupled and situated in the test box appropriately.

On the Hearing Aid Test (HAT) section of the keypad, press <LINEAR> or <AGC>, depending on the circuit type of aid you are testing. The ANSI S3.22-1996 recommended measurements will be performed and the results should be compared to the specifications provided by the hearing aid manufacturer. The dispenser must judge whether or not the current hearing aid is meeting specifications and tolerances. If the aid does not operate according to specifications, the dispenser must return the aid to the manufacturer for repair or replacement.

### Fitting Hearing Aids to Targets Using the Audioscan RM500

Ensure that the hearing aid is coupled and situated in the test box appropriately.

#### Linear

1. Set the hearing aid to full on and close the lid on the test chamber.
2. In REM mode press <ADVANCED FEATURES>
3. In the 'Tests' menu select 'Speechmap/DSL' menu and press <CONTINUE>
4. Press <AGRAM>. Set the parameters in the menu (i.e. Age=6 months, Transducer=insert phone, UCL=avg, RECD=enter) by using the cursor and arrow keys. Press <CONTINUE>
5. The next screen will prompt you to enter an audiogram. Enter thresholds using the arrow and cursor keys. Press <CONTINUE>
6. If you chose 'RECD=enter' in Step 4, enter the RECD values using the arrow and cursor keys. Press <CONTINUE>
7. The top right of the main screen shows the style of hearing aid chosen (i.e., BTE). Change this by using the arrow keys.
8. Set the mode to 'S-REM' using the arrow keys.
9. Press <AIDED 1> to start the signal. Using the arrow keys, change the signal level to 'MPO'.
10. Make adjustments to the aid so that the MPO does not exceed targets (\*) at any frequency.
11. Press <CONTINUE> to store the curve.
12. Press <AIDED 2> and change the signal level to 'Dynamic' or 'Swept' and 'Average' using the arrow keys.
13. Adjust the aid to meet average targets (+).
14. Press <CONTINUE> to store the curve.

#### WDRC (Note: Refer to EDI AppNote 97-03 for more specific instructions)

1. Follow steps 1 through 8 in the Linear section. If you wish to 'Measure' or 'Enter' an RECD, you may choose this in the <AGRAM> menu.
2. Press <AIDED 1> to start the signal. Change the signal level to 'Dynamic' or 'Swept' and 'Average' using the arrow keys.
3. Adjust the aid to meet average targets (+).
4. Press <CONTINUE> to store the curve.

5. Press <AIDED 2> and change to dynamic signal to '*Soft/Loud*' to check targets at various input levels.
6. Press <CONTINUE> to store the curve.
7. Press <AIDED 3> and change the signal level to '*MPO*'.
8. Make adjustments to the aid so that the MPO does not exceed targets (\*) at any frequency.
9. Press <CONTINUE> to store the curve.

\*\*This protocol is applicable to both analogue and digital hearing aid circuit types.

#### Manual Control

In order to obtain specific values (instead of curves) this can be done in the HAT mode.

Press <ADVANCED FEATURES>

In the '*Tool Kit*' menu select '*Manual Control*'

Use the arrow keys to obtain information about gain at various input levels and frequencies.

## APPENDIX C

### **Orientation Checklist**

Below is a suggested Orientation Checklist or a set of discussion topics for clinicians and families. Audiologists and dispensers will need to ensure that all of the following are covered in discussion and related questions are answered.

- Amplification and the speech signal, e.g. explanation of aided audibility and its implications for speech and language development
- Impact of noise and distance
- Coping with noise and distance (e.g. at home, in the car)
- Equipment needed to care for hearing aids
- Techniques for cleaning earmolds and hearing aids
- Procedures for battery checks and insertion
- Procedures for listening checks of hearing aids
- Putting hearing aids on the child and securing them – retention and loss-prevention
- Setting user controls
- Incorporating use of hearing aids into the child's routine
- Plans for documenting experiences with hearing aids – hearing aid diaries could be provided or recommended
- Safety issues (e.g. battery ingestion)
- Understanding and combating feedback
- Protecting the hearing aids from potential hazards (e.g. moisture, pets)
- Troubleshooting techniques
- Trial periods, warranty and insurance information
- Financial Assistance information (e.g. Assistive Devices Program)
- Plans for repair of malfunctioning hearing aids
- Discussion of earmold life expectancy and hearing aid life expectancy
- Plans for follow-up contact between the family and clinician
- Options to be used at a later date (e.g. T-coil)

Adapted from: Elfenbein, Jill L. 2000. Batteries Required: Instructing Families on the Use of Hearing Instruments. In R.C. Seewald, (ed.), *A Sound Foundation Through Early Amplification: Proceedings of an International Conference* (pp.141-149 Table 1).

### **Pediatric Considerations**

The unique needs of the infant must be considered when selecting non-acoustic features of the hearing aids. Tamper resistant battery doors should be implemented, because hearing aid batteries are toxic if ingested. Applying a volume control cover or lock will ensure that the infant is wearing the hearing aids at the prescribed volume setting at all times. Pediatric earhooks should also be utilized as a loss retention device as well as for filtering for appropriate acoustic outcomes. Non-acoustic features of hearing aids should ideally be selected as part of the amplification prescription, but may be discussed between the prescriber and dispenser prior to ordering and fitting the devices.

### **Care and Maintenance "Kit"**

Dry Aid Kit for removing moisture from the hearing aid and earmold  
Stethoscope for daily listening check

Battery Tester

Earmold Blower for removing moisture and debris

Hearing aid 'Clips' or Huggie Aids to prevent loss and protect from damage

Care and maintenance kits are available upon request from the hearing aid manufacturers for pediatric fittings, as are *special pediatric extended warranties*.

In addition to the above list, manufacturers' kits may also include:

Other cleaning tools

Informational brochures, videos, books, stickers

Carrying case