World Health Organization

Hearing aid service delivery approaches

for low- and middle-income settings

Hearing aid service delivery approaches for low- and middle-income settings

World Health Organization

Hearing aid service delivery approaches for low- and middle-income settings

ISBN 978-92-4-008792-7 (electronic version)
ISBN 978-92-4-008793-4 (print version)

© World Health Organization 2023

Some rights reserved. This work is available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo).

Under the terms of this licence, you may copy, redistribute and adapt the work for non-commercial purposes, provided the work is appropriately cited, as indicated below. In any use of this work, there should be no suggestion that WHO endorses any specific organization, products or services. The use of the WHO logo is not permitted. If you adapt the work, then you must license your work under the same or equivalent Creative Commons licence. If you create a translation of this work, you should add the following disclaimer along with the suggested citation: "This translation was not created by the World Health Organization (WHO). WHO is not responsible for the content or accuracy of this translation. The original English edition shall be the binding and authentic edition".

Any mediation relating to disputes arising under the licence shall be conducted in accordance with the mediation rules of the World Intellectual Property Organization (http://www.wipo.int/amc/en/mediation/rules/).

Suggested citation. Hearing aid service delivery approaches for low- and middle-income settings. Geneva: World Health Organization; 2023. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at https://iris.who.int/.

Sales, rights and licensing. To purchase WHO publications, see https://www.who.int/publications/book-orders. To submit requests for commercial use and queries on rights and licensing, see https://www.who.int/copyright.

Third-party materials. If you wish to reuse material from this work that is attributed to a third party, such as tables, figures or images, it is your responsibility to determine whether permission is needed for that reuse and to obtain permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

General disclaimers. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by WHO in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by WHO to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall WHO be liable for damages arising from its use.

Design by Inis Communication

Contents

Acknowledgements ..... **v**

Abbreviations ..... **vii**

Glossary of terms ..... **viii**

Executive summary ..... **ix**

Introduction **3**

1 General framework **9**

1.1 Key principles 9

1.2 Approaches 10

1.3 Programme workers and setting 10

1.4 Considerations for hearing aids 11

1.5 Counselling 11

1.6 Follow-up 11

1.7 Referral criteria 11

2 Hearing aid service delivery approach for adults **17**

2.1 Objective 17

2.2 Indications for referral 17

2.3 Steps for hearing aid service delivery for adults 18

2.4 First appointment 19

2.5 First follow-up (two weeks after fitting) 22

2.6 Second follow-up (two months after fitting) 24

2.7 Long-term follow-up (every two years, in person) 25

2.8 Appointments on demand 25

3 Hearing aid service delivery approach for children **29**

3.1 Objective 29

3.2 Indications for referral 30

3.3 Steps for hearing aid service delivery for children 31
3.4 First appointment 32
3.5 First follow-up (in person, two weeks after fitting) 37
3.6 Second follow-up (two months after fitting) 39
3.7 Long-term follow-up 40
3.8 Appointments on demand 41

4 Considerations for implementation 45
4.1 Planning 45
4.2 Policy and finance 46
4.3 Human resources and training requirements 47
4.4 Equipment and infrastructure requirements 48
4.5 Referral pathway 48
4.6 Follow-up and counselling 49
4.7 Data management 49
4.8 Indicators 49

References 51

Annex 1. Grades of hearing loss 53

Annex 2. Ling sounds test 55

Annex 3. International Outcome Inventory for Hearing Aids 57

Annex 4. First appointment and follow-up forms 60

Annex 5. Examination of the ear 64

Annex 6. Infrastructure and equipment 69

Annex 7. Management of conflict of interest 71

Acknowledgements

This resource is the outcome of a consultative process led by the World Health Organization (WHO). It was drafted by Shelly Chadha (WHO) Lauren Dillard (WHO, Medical University of South Carolina) and Carolina Der (WHO) under the guidance of Alarcos Cieza and Bente Mikkelsen.

Members of the technical working groups and external reviewers who contributed to the development, review of this training manual include Jackie Clark (Co-chair, Coalition for Global Hearing Health; Professor of Audiology, University of Texas, United States of America); Victor de Andrade (Senior Lecturer and Audiologist, University of the Witwatersrand, Johannesburg, South Africa); Rachael Hapunda (Focal point, Ear and Hearing Care, Ministry of Health, Zambia); Hubert Ramos (Program Head of Clinical Audiology, University of Santo Tomas, Philippines); Diego Santana-Hernández (Senior Ear and Hearing Care CBID Advisor, CBM, Spain); De Wet Swanepoel (Professor of Audiology, University of Pretoria, South Africa); Patricia Castellanos (Audiologist and Medical Director of CEDAF, Guatemala); Bradley McPherson (Professor of Audiology, University of Hong Kong); John Newall (Senior Lecturer, Department of Linguistics, Macquarie University, Australia); Serah Ndwega (Audiologist, University of Nairobi, Kenya); Carrie Nieman (Associate Professor of Otolaryngology – Head and Neck Surgery Johns Hopkins School of Medicine, United States of America); Ruth Thomsen (Scientific Director NHSE London, England); Asha Yathiraj (All India Institute of Speech and Hearing, India); Annette Kaspar (Australian public health research audiologist, Ear Nose and Throat Clinic, Tupua Tamasese Meaole Hospital, Ministry of Health, Samoa); Natalia Tamblay (Ministry of Health of Chile and Assistant Professor in the University of Chile); Audra Renyi (WWHearing, Canada); Ruth Warick (Immediate Past President at International Federation of Hard of Hearing People & President, BC Chapter of the Canadian Hard of Hearing Association, Canada); Peter Thorne (Professor, Faculty of Medical and Health Sciences, Audiology, University of Auckland, New Zealand); Deborah Viviane Ferrari (Associate Professor, Universidade de São Paulo, Brazil); George Tavartkiladze (Head of the Audiology Department, Russian Medical Academy of Continuing Professional Education, President of National Medical Association of Audiologists, Russian Federation); Paige Stringer (Founder and Executive Director, Global Foundation For Children With Hearing Loss, United States of America).

Pilot implementation of the service delivery approaches has been carried out in India by the Society for Sound Hearing and Maulana Azad Medical College, Delhi; in

South Africa by hearX Foundation and the University of Pretoria; and in the United States by John Hopkins School of Medicine.

The following WHO staff members and consultants contributed to the technical content and its review: Ariane Laplante-Levesque, Satish Mishra, Chitra Chander, Carolina Hommes, Pallavi Mishra, Emma Tebbutt, Tashi Tobgay, Kylie Shae, Kouamivi Agboyibor, Prebo Barango, Elick Narayan, Hala Sakr, Joao Furtado, Solara Sinno, Nuria Toro Polanco, John Fogarty and Yuka Sumi. Barbara Goedde, Anil Kashyap, and Emily Wootton, of the ATscale Global partnership for assistive technologies, provided strategic direction for developing these approaches.

Financial support for development of the manual was provided by ATscale Global Partnership for Assistive Technologies.

Abbreviations

dB: decibels

ENT: ear, nose and throat

HEARS: Hearing health Equity through Accessible Research and Solutions

INEI: Instituto Nacional de Estadística e Informática National, Peru

IOI-HA: International Outcomes Inventory – Hearing Aids

LMICs: low-and middle-income countries

OPC: Oír para Crecer

PHC: primary health care

PSHA: Pensylvania speech-language-hearing association

WHA: World Health Assembly

WHO: World Health Organization

Glossary of terms

Health facility: primary, secondary or tertiary health care centre where referrals are to be made.

Programme: hearing aid service delivery programme that aligns with the approaches to service delivery outlined in this document. It includes hearing loss diagnosis; assessment of candidacy for hearing aids; fitting and maintenance of hearing aids; counselling; follow-up; and referral.

Programme team: staff providing services as part of the programme.

Programme worker: non-specialist such as community worker, primary health care (PHC) worker, nurse, or other, fully trained to perform all the tasks of the programme. Programme workers must work on site.

Programme supervisor: ear and hearing care specialist, including ear, nose and throat (ENT) specialist, audiologist, or other, in charge of the supervision of the programme, and first specialist evaluation if support is required by the programme workers. A programme supervisor can work on site or remotely.

Referral centre: local health facility that has the specialists and equipment necessary to address ear and/or hearing conditions that are beyond the scope of the programme.

Steering committee: panel of national or local experts and stakeholders, ideally led by the Ministry of Health, that systematically discusses and plans for hearing aid service provision.

Executive summary

Background and purpose

Globally, it is estimated that while over 400 million people could benefit by using hearing aids alone, fewer than 20% have access to use these devices *(1, 2)*.

This immense gap poses a significant challenge worldwide, especially since unaddressed hearing loss is a leading cause of morbidity *(3)* and incurs an annual global cost of 980 billion international dollars *(4)*.

One of the main limitations to accessing hearing aids is the lack of diagnostic and rehabilitative services, especially at primary and secondary levels of care. This is due to the small number of specialists in ear and hearing care, and to their poor territorial distribution which is more evident in low- and middle-income countries *(1)*.

This document describes approaches proposed by the World Health Organization (WHO) to narrow the gap by delivering hearing aid services in low- and middle-income settings provided by trained non-specialists at the primary level of care. The approaches are based on the strategy of task-sharing outlined in the *World report on hearing (1)* and are accompanied by useful community resources and an online training module (TAP module for hearing aids – currently under development).

Principles for hearing aid service delivery

The approaches proposed in this document are based on the following principles:

- The purpose of the service delivery approaches elaborated in this document is to promote access to hearing rehabilitation using affordable, high-quality hearing aids for those who need them, in low- and middle-income settings.
- These approaches are based on the concept of task-sharing and focus on hearing aid service provision by trained non-specialists. The overall supervision for a hearing aid programme based on these approaches must be provided by an ear and hearing care specialist such as an audiologist, otolaryngologist, or others.
- Service delivery approaches are to be implemented only in discussion with local stakeholders, including people with hearing loss, and adapted to the sociocultural realities of the setting.

- Hearing aid provision must not to be a stand-alone service, but part of integrated ear and hearing care services, in which primary health care plays a major role.
- As far as possible, efforts should be made to provide these services in conjunction with other health services such as eye care, care of older persons, assistive technology initiatives and others.
- These approaches are designed to be geographically close to communities and implemented with limited infrastructure. These models can be implemented at a health facility that provides a permanent structure for service provision; or through community outreach (without a permanent physical structure); or a combination of the two. When services are provided exclusively through community outreach, a viable method for providing follow up services and appointments should be worked out.
- Recipients of hearing aids can be enrolled in the programme through diverse routes such as during a screening programme, through referral by a specialist, or self-referral (i.e. people who come to a facility seeking services themselves).
- Hearing aids that are fitted must conform to the WHO Preferred profile for hearing aids and related technical specifications;[1] .
- The fitting of hearing aids is to be recommended to those assessed as needing them; but the decision to undergo fitting and receive services should rest with the individuals themselves. It is important to note that fitting hearing aids cannot replace the use of sign language in those who need it.
- Counselling is a very important part of the process, and is to be provided before, during and after hearing aid fitting.
- Follow-up is a crucial part of the service delivery. Where feasible and acceptable, telehealth modalities can be applied for ease of follow-up. However, those requiring in-person support should be able to access the programme workers, as needed, including appointments on demand.
- Note that hearing aid provision forms only one part of hearing care services. When developing such a service, it is important to ensure that those identified as requiring medical or surgical treatment for ear diseases, rehabilitative/auditory-verbal therapy or sign language learning can be referred to a suitable, accessible health facility where these services are available. The referral pathways must be pre-defined at the time of planning.
- To be effective, any such programme must be accompanied by efforts to raise awareness about hearing loss and the importance of timely hearing care.

[1] Preferred profile for hearing-aid technology suitable for low- and middle-income countries. Geneva: World Health Organization; 2017.

Service delivery approaches

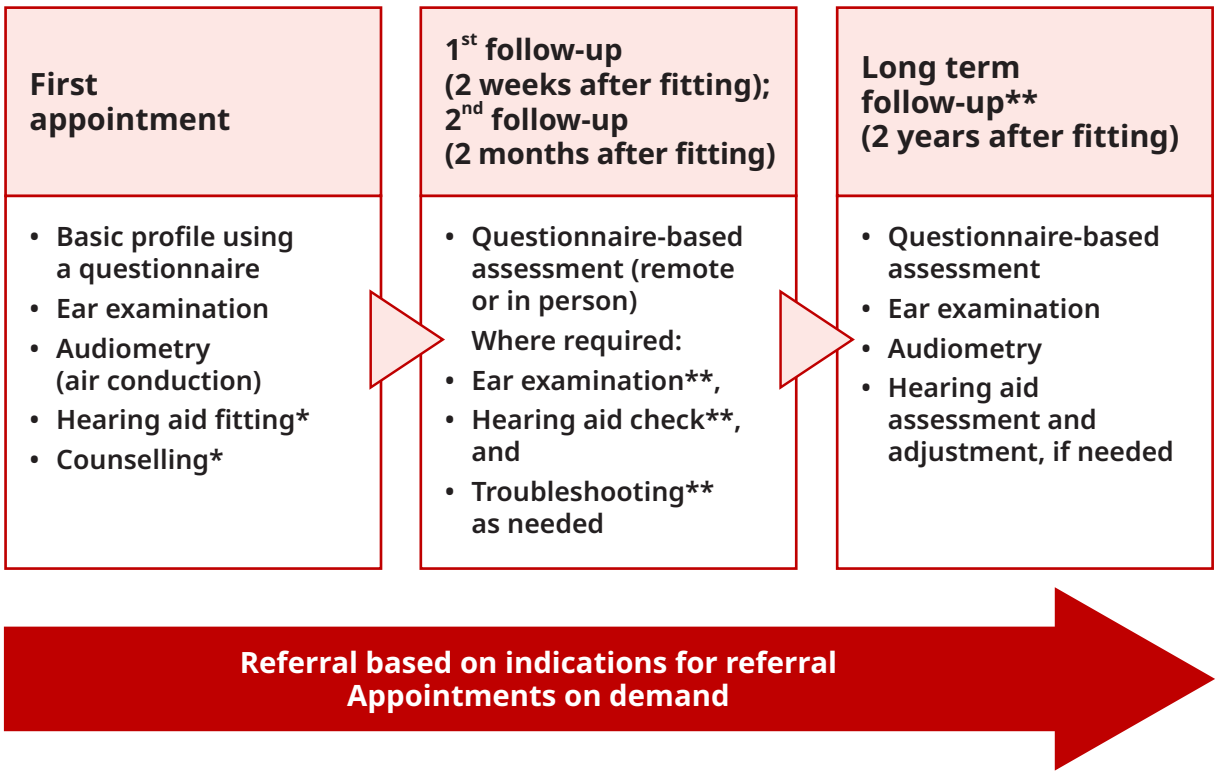
The approaches for hearing aid fitting and services target two population groups: i) adults with moderate to severe hearing loss, and ii) children above five years of age with mild to moderately severe post-lingual hearing loss.

Details of these approaches are provided in sections 2 and 3 and include directions on who should be fitted with a hearing aid, who should be referred to be seen by an ear and hearing care specialist, the process of assessment, the tools to be used, and follow-up protocols. A summary of the steps is provided below.

Hearing aid service delivery approach for adults

This model is for providing affordable, high-quality hearing aids to adults of all ages that experience moderate to severe hearing loss in the better hearing ear. Persons with single-sided hearing loss may be fitted, if resources and national guidelines permit. While unilateral hearing aid fitting is recommended in this document, bilateral hearing aids must be given when resources permit. The process is summarized in Fig. i.

Fig. i. Hearing aid service delivery approach for adults



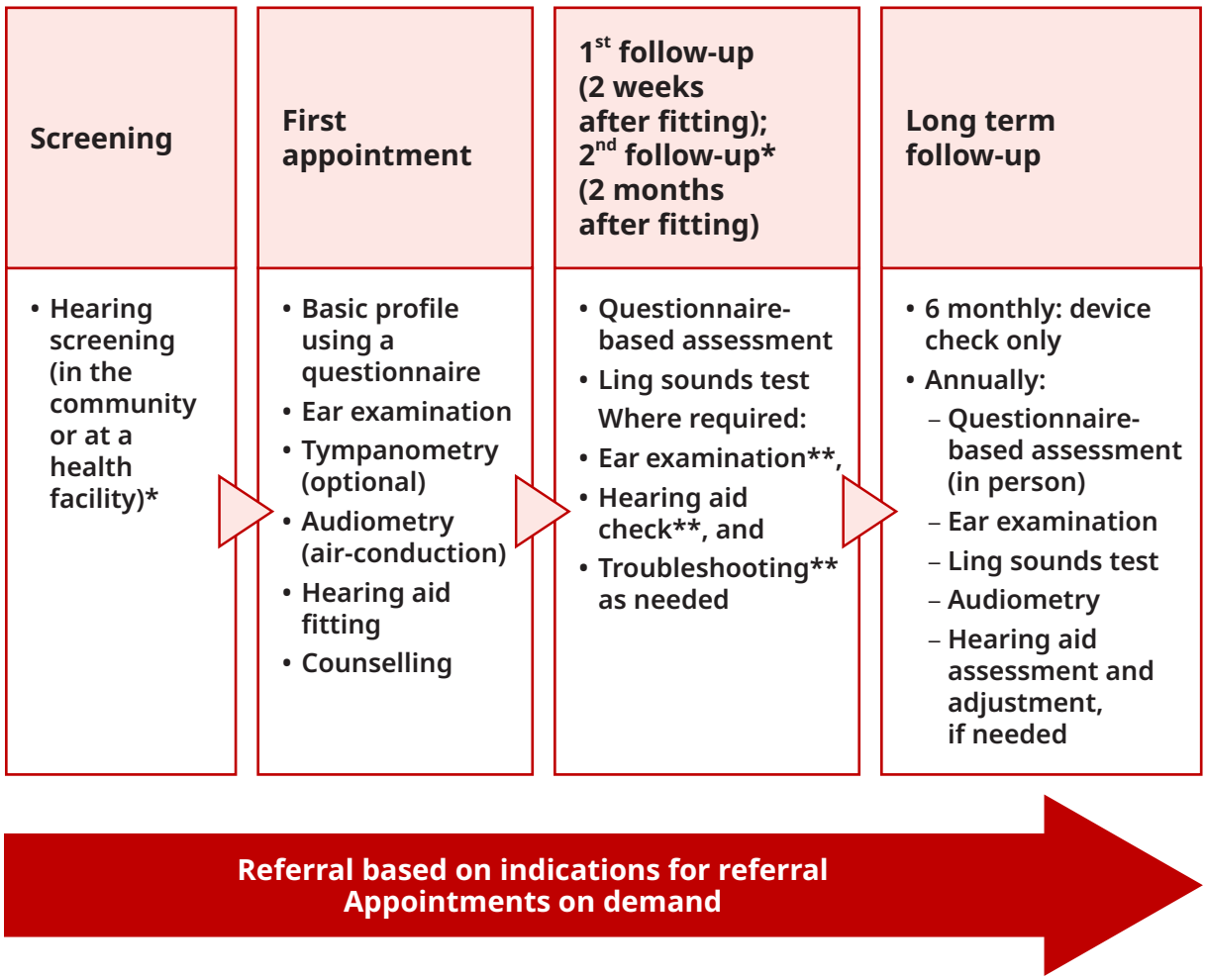
* Hearing aid, counselling and fitting can be done at a second appointment, if needed.

** These steps must be done through in person appointments.

Hearing aid service delivery approach for children

This model is for providing affordable, high-quality hearing aids to children 5–18 years old with postlingual hearing loss that is mild to moderately severe. Children with prelingual hearing loss or those with severe or profound loss should be referred for specialist intervention. Binaural fitting must be provided for children where this is needed. The process is summarized in Fig. ii.

Fig. ii. Hearing aid service delivery approach for children



* Only those who fail hearing screening should be progressed to the next step for assessment.

** These steps must be done through in person appointments.

Considerations for implementation

This document provides a useful resource for those planning to implement a national or subnational community level hearing aid service delivery programme. The service delivery approaches outlined may be adapted for application within different cultural contexts and settings and aligned with the available infrastructure; however, the principles described should not be compromised.

The section titled 'Considerations for implementation' and relevant annexes provide an overview of planning aspects including policy considerations, equipment and infrastructure requirements, follow-up, counselling, data management and indicators. Accompanying online training resource for non-specialists will be available here. The document should be read in full and discussed with a local committee or group consisting of policymakers, service providers (including specialists and non-specialists) and users of hearing aids, prior to implementation.

Introduction

Hearing is critical to a person's overall health and for achieving a high quality of life. It influences the way a person integrates into and relates to society and can significantly impact education and employment opportunities. Hearing is important in child development, and for the social wellbeing, and cognitive functioning of older adults.

More than 430 million people live with disabling hearing loss which, when unaddressed, affects the quality of their lives. This number is expected to increase significantly in the coming years *(1)*. An overwhelming majority of people with hearing loss reside in low- and middle-income countries. Most of those who have hearing loss can benefit greatly from timely and effective interventions, such as the use of hearing devices (hearing aids and implants) along with rehabilitative services.

It is estimated that while more than 400 million people worldwide could benefit from hearing aid use alone, only 17% get to use these devices *(2)*. This gap of 83% poses a substantial global challenge: unaddressed hearing loss is a leading cause of morbidity *(3)* with an annual global cost of 980 billion international dollars *(4)*.

One of the main limitations to accessing hearing aids is the lack of diagnostic and rehabilitative services. This is due to the low number of ear and hearing care specialists or to their poor territorial distribution, which is more noticeable in low- and middle-income countries (LMICs) *(1)*.

This issue is highlighted in the two World Health Assembly (WHA) resolutions: WHA70.13 on the prevention of deafness and hearing loss *(5)* (adopted in 2017), and WHA71.8 on improving access to assistive technology *(6)*. Improving access to hearing care, including hearing aids, is an important step in mitigating the adverse impact of hearing loss.

In view of this, WHO has been collaborating with ATscale[2] to develop a market-shaping strategy which focuses on the challenges of resource-constrained settings. As part of its work, ATscale released a "Hearing aids product narrative" in March 2020 *(7)*. This identified five strategic objectives for improving access to hearing aids and related services. The first objective (SO#1) is to "Strengthen global policy guidance around service delivery standards, product selection and product quality"

[2] See: https://www.atscale.com.

and one suggested intervention is to develop and disseminate a Preferred Service Delivery Profile that is evidence-based, simplified, and based on the principles of task-shifting/sharing, for provision of affordable, high-quality, easy-to-fit hearing aids and related services *(7)*. Since then, ATscale has undertaken a project to determine the appropriateness of pre-programmed hearing aids and study audiological profiles most suited to the needs of the target populations.

The current proposal is intended to progress work on this strategic objective by developing service delivery approaches for the provision and maintenance of hearing aids along with information materials to facilitate their adoption, especially in resource-limited settings of the world. This project envisages the use of simple-to-fit devices (e.g. preprogrammed hearing aids) and is based on the strategy of task-sharing outlined in the *World report on hearing (1),* from highly trained audiologists to trained non-specialists or health workers. This work has been conducted through collaboration between WHO and ATscale, in consultation with global experts.

Purpose of the document

This document is intended for use by people – primarily in resource-limited settings – who plan to implement a national or subnational community level programme for the delivery of hearing aid services. Intended users include ear and hearing care coordinators or focal points within ministries of health; public health planners; and nongovernmental organizations or civil society entities that provide ear and hearing care. The document provides practical information for facilitating the assessment of hearing, the fitting of hearing aids and follow-up of children aged above five years, adults and older adults.

Development of the document

The document was developed through consultative and evidence-based approaches with the technical support of an expert technical working group. The process of developing the approaches included:

- a systematic scoping review of the literature focusing on hearing aids; service delivery experiences in resource-limited settings
- review of market-shaping project reports and outcomes related to hearing aids;
- interviews of experts with experience in provision of hearing aids in low- and middle-income countries, and resource-limited settings within high-income countries;
- a Delphi survey for experts to address key questions;

- inputs, feedback and review by the technical working group;
- discussion with, and inputs from, a multistakeholder group including hearing aid users; and
- pilots conducted in three resource-limited locations in India, South Africa and the United States of America.

The approaches outlined in this document are based on reviewed evidence and expert input. They were evaluated by the technical working group and stakeholder group as well as internal WHO teams prior to finalization.

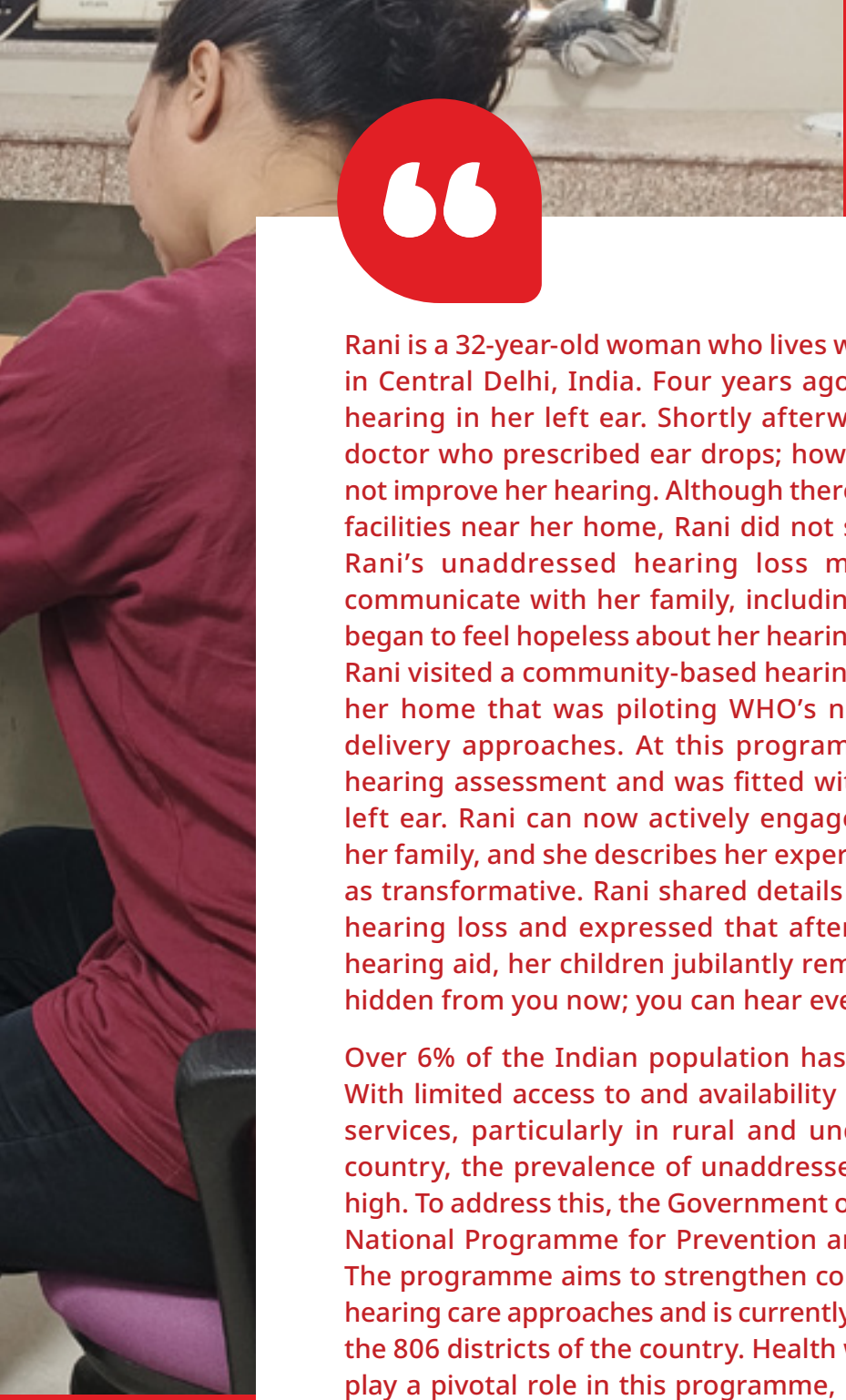
Use of the document

The document provides guidance on important factors to be considered when developing a community-level programme for the delivery of hearing aid services in low- and middle-income settings.

The approaches include target two population groups: children aged older than five years, and adults aged 18 years and older. The approaches provide directions on who should be fitted with a hearing aid; the process of assessment; the tools to be used; and the protocol for follow-up.

© Society of sound hearing (Sound hearing 2030) and Maulan Azad Medical College and Associated Hospitals New Delhi India

Example of a successful community-based government ear and hearing care programme: a case study from India



Rani is a 32-year-old woman who lives with her extended family in Central Delhi, India. Four years ago, she suddenly lost her hearing in her left ear. Shortly afterwards she visited a local doctor who prescribed ear drops; however, this treatment did not improve her hearing. Although there are several health-care facilities near her home, Rani did not seek further treatment. Rani's unaddressed hearing loss made it challenging to communicate with her family, including her children, and she began to feel hopeless about her hearing loss. After a few years, Rani visited a community-based hearing care programme near her home that was piloting WHO's new hearing aid service delivery approaches. At this programme, Rani underwent a hearing assessment and was fitted with a hearing aid for her left ear. Rani can now actively engage in conversations with her family, and she describes her experience with a hearing aid as transformative. Rani shared details about her journey with hearing loss and expressed that after she started using her hearing aid, her children jubilantly remarked, "Nothing can be hidden from you now; you can hear everything we are saying!"

Over 6% of the Indian population has disabling hearing loss. With limited access to and availability of ear and hearing care services, particularly in rural and underserved areas of the country, the prevalence of unaddressed hearing loss remains high. To address this, the Government of India has launched the National Programme for Prevention and Control of Deafness. The programme aims to strengthen community-based ear and hearing care approaches and is currently running in nearly 600 of the 806 districts of the country. Health workers at primary level play a pivotal role in this programme, providing basic services for the identification and management of ear and hearing problems. Rani's case is an example of the positive outcomes that are achievable through community-based ear and hearing care approaches and demonstrates that such approaches are impactful for individuals with hearing loss as well as their families.

Case study provided by Dr Suneela Garg,
Honorary Secretary General,
Society for Sound Hearing, India

1 General framework

This document provides a description of approaches for provision of high-quality, affordable, easy-to-fit hearing aids and related services that could be suitable in low- and middle-income settings. The overall framework for implementing this is described below.

1.1 Key principles

The underlying principles and objectives are:

- The purpose of the service delivery approaches elaborated in this document is to promote access to hearing rehabilitation using affordable, high-quality hearing aids for those who need them, in low- and middle-income settings; and to narrow the gap between need for, and access to, hearing aids.
- These approaches are based on the concept of task-sharing and focus on hearing aid service provision by trained non-specialists. The overall supervision, for a hearing aid programme that is based on these approaches, must be provided by an ear and hearing care specialist such as an audiologist, otolaryngologist, or others.
- Service delivery approaches are to be implemented only in discussion with local stakeholders, including people with hearing loss, and adapted to the sociocultural realities of the setting.
- Hearing aid provision must not to be a stand-alone service, but part of integrated ear and hearing care services, in which primary health care plays a major role.
- It is to be noted that hearing aid provision forms only one part of hearing care services. When developing such a service, it is important to ensure that those identified as requiring medical or surgical treatment for ear diseases, rehabilitative/auditory-verbal therapy or sign language learning can be referred to a suitable, accessible health facility where these services are available.

- As far as possible, efforts should be made to provide these services in conjunction with other health services such as eye care, care of older persons, assistive technology initiatives and others.
- To be effective, any such programme has to be accompanied by efforts to raise awareness about hearing loss and the importance of timely hearing care.

1.2 Approaches

The two approaches developed for hearing aid service delivery are for adults, aged above 18 years, with moderate to severe hearing loss, tested with otoscopy and air conduction audiometry; and for children, aged 5–18 years, with mild to moderately severe and post-lingual hearing loss, tested with otoscopy, tympanometry (where possible), and air conduction audiometry.

Note: It is important to note that the needs of children below the age of 5 years, or children with pre-lingual or profound hearing loss, cannot be addressed through community-based approaches. Nevertheless, their needs, including the need for rehabilitative therapy, sign language and others, should be addressed as part of the overall hearing care strategy. When considering current knowledge and technology, these groups require specialized testing and specialist intervention. These interventions are further elaborated in the WHO Package of interventions for rehabilitation – sensory functions module *(13)*.

1.3 Programme workers and setting

These approaches are designed to be geographically close to communities and implemented with limited infrastructure. These models can be implemented at a health facility that provides a permanent structure for service provision; or through community outreach (without a permanent physical structure); or a combination of the two.

When services are provided exclusively through community outreach, a viable method for providing follow-up services and appointments should be worked out. Ideally, it should be part of an overall strategy for integrated people-centred ear and hearing care or eye and hearing care, implemented through the national health system.

Although programme workers should be trained non-specialists, such as community workers, nurses, or primary health care workers *(10)*, the mentor or supervisor must be a specialist (for example, an audiologist, an ENT, or ear and hearing care specialist).

1.4 Considerations for hearing aids

- Hearing aids to be used in the programme must conform to the specifications described in WHO's Preferred *profile for hearing-aid technology suitable for low- and middle-income countries (8).* It is preferable to use preprogrammed or similarly easy-to-fit hearing aids, that are of high quality. High-quality self-fit hearing aids may also be considered.
- Preshaped standard moulds for hearing aids can be used for adults, whereas for children, custom-made moulds are most suitable if provision is feasible (this is not considered mandatory in this approach).
- Depending upon availability and local context, the use of rechargeable devices or batteries may be considered.
- The provision and replenishment of battery supplies will depend on the resources available in each setting; any decision on this should consider the local context.

1.5 Counselling

Counselling is a very important part of the service delivery process and must be provided before, during and after the hearing aid fitting. The WHO flyer on hearing aids is a useful tool to support counselling *(9)*.

The fitting of hearing aids is to be recommended to those assessed as needing them; but the decision to undergo fitting and receive services should rest with the individuals themselves. It is important to note that fitting hearing aids cannot replace the use of sign language in those who need it.

1.6 Follow-up

The service delivery approaches propose follow-up using telehealth modalities if possible and acceptable in the local context. However, for people requiring in-person support, facility and programme workers should be accessible, as needed.

1.7 Referral criteria

Referral criteria are listed for each of the two approaches. In cases where the individual meets any of the criteria, or the rehabilitation process requires resources

not available within the programme, the person must be referred to the pre-defined health facility or health-care provider. Referral can be to a non-specialist or a specialist, depending upon the indication and human resource availability.

If a person has been fitted with a hearing aid and faces a problem that cannot be addressed by the programme worker/s, the person must be provided with a tele-consultation or in-person evaluation by a specialist in charge of overseeing the programme.

Note: The provision of such a service would inevitably lead to identification of people whose needs cannot be addressed through a hearing aid, such as those with ear diseases requiring medical or surgical treatment, persons in need of rehabilitative/auditory-verbal therapy or sign language learning. The referral path for such persons must be pre-defined at planning stage.

© Tersia De Kock

Addressing the challenge of specialist shortages in low- and middle-income countries: a case study from South Africa

Mrs Booi is an older woman who lives with her family in Khayelitsha, a township near Cape Town, South Africa. She experienced hearing loss for several years but never received hearing services. She attends the Mzamomhle Senior Club, which provides daytime activities related to health and socialization for older people. Through a community-based ear and hearing care programme, Mrs Booi underwent otoscopy, hearing assessment, hearing aid fitting and related counselling, all of which took approximately one hour. The trained health worker noticed Mrs Booi experienced difficulties with hearing aid insertion and removal. Given that Mrs Booi lived near to the Mzamomhle Senior Club, the health worker was able to go to Mrs Booi's house and ask her granddaughter to observe and assist with the hearing aid fitting session. On the day she received her hearing aids, Mrs Booi's demeanor was initially quiet and serious, but this changed when she fitted her hearing aids and she became social and talkative.

South Africa has a high prevalence of unaddressed hearing loss, in part due to difficulties related to access to and availability of hearing-related services. Community-based ear and hearing care approaches are based on task-sharing among trained health workers and certified audiologists, and aim to overcome such difficulties. Trained health workers provide services across the continuum of ear and hearing care, including education, hearing screenings, hearing assessments, hearing aid fittings, counselling, and follow-up services. These services are supported by high-quality and low-cost digital technologies and mHealth. For example, the hearX Foundation, affiliated with researchers at the University of Pretoria, provides community-based ear and hearing care. Providers use compact, portable equipment that can be easily transported; mHealth technologies are used to send infographics and voice messages related to hearing aid follow-up; and counselling is accessible via WhatsApp.

Case study provided by Tersia de Kock,
Audiologist and Director of hearX Foundation,
South Africa

2 Hearing aid service delivery approach for adults

2.1 Objective

The **objective** of the service delivery approach is to promote access to hearing rehabilitation using affordable, high-quality, easy-to-fit hearing aids for adults who need them, in low- and middle-income settings.

> **Note:** It is essential to follow the principles outlined in section 1, General framework to ensure that the service delivered does not cause harm in the community or perpetuate stigma related either to hearing loss or to the use of hearing aids. Implementers of the programme should review these issues carefully, along with the approach outlined below.

As described above, **entry** into this model of service delivery can be through a community-based screening programme, referral from another health facility or self-referral. Although the objective is to have follow-up with scheduled frequencies, people enrolled in the programme should always be able to consult with programme workers spontaneously if they consider it necessary.

2.2 Indications for referral

As defined in the implementation protocol, if at any point during the assessment or follow-up, problems are encountered, the individual should be counselled and referred to a doctor or hearing care specialist. Complaints may include:

a. agenesis or severe malformation of the external auditory canal;

b. ear trauma;

c. history of acute pain, active drainage, or bleeding from an ear;

d. recurrent or chronic otitis media;

e. dry perforation of the tympanic membrane;

f. sudden onset or rapidly progressive hearing loss;

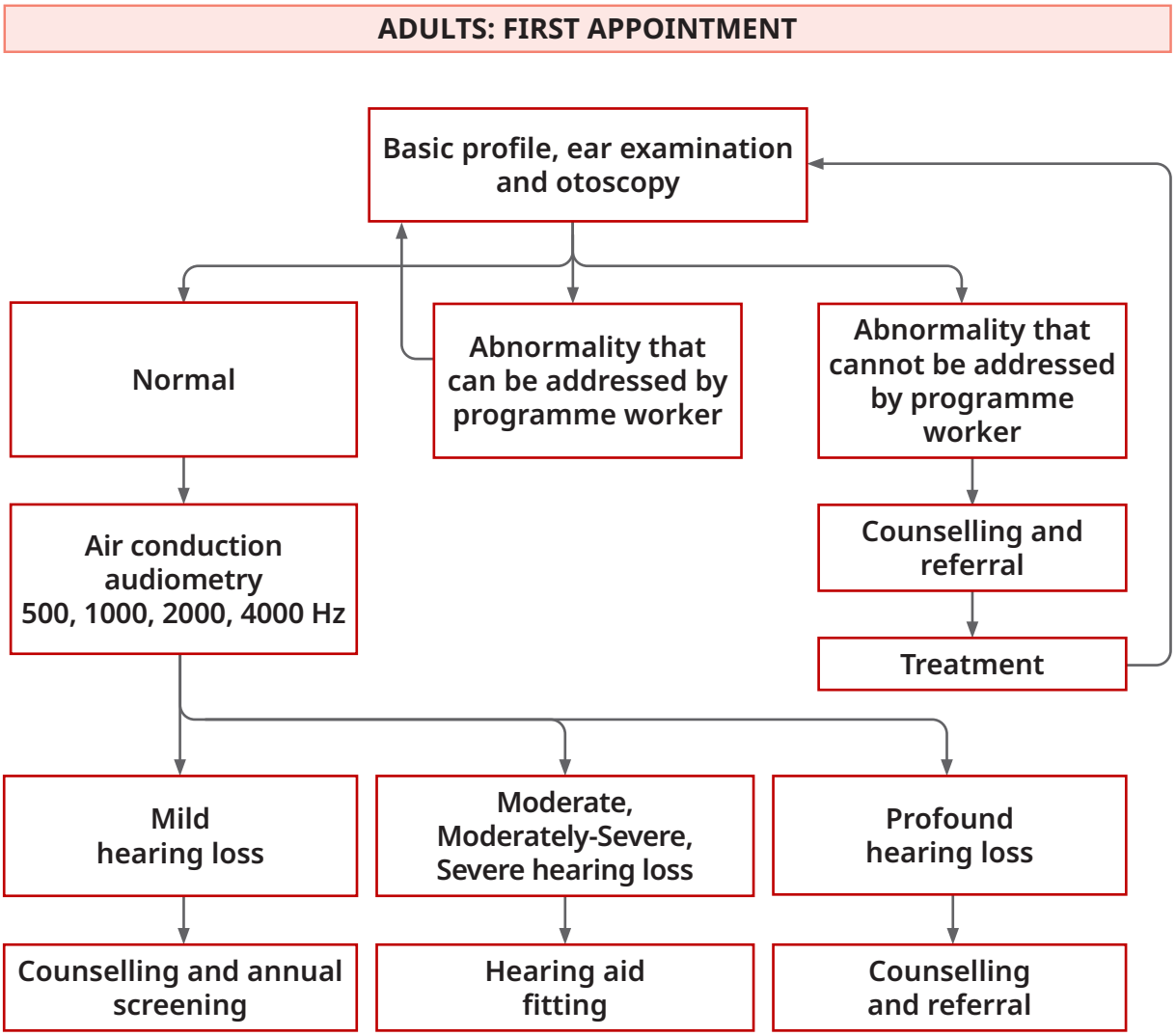
g. unilateral or asymmetric hearing loss; and

h. pulsatile tinnitus.

2.3 Steps for hearing aid service delivery for adults

Entry into a programme can be through a community-based screening programme, referral from a health facility or by self-referral. The steps to be taken during the first appointment are illustrated in the flow chart below (Fig. 1).

Fig. 1. Service delivery approach for adults: first appointment



2.4 First appointment

Step 1: Basic profile and otoscopy

The first step in the service delivery approach is to take a brief history of the person and ask questions with the aim of recording demographic information. A sample questionnaire for this purpose is provided in Annex 4. This is followed by an examination of both ears including an otoscopy *(10)* (see Annex 5). Following the history-taking and ear examination:

- If there are no symptoms or signs matching the referral criteria, the person can advance to Step 2 (audiometry).
- If wax or foreign body is identified in the ear canal, this can be addressed by the health worker through wax or foreign body removal at the same or a subsequent visit. Once addressed, the otoscopic examination should be repeated.
- If any of the referral criteria are met, the person should be referred for evaluation to the pre-defined health facility or hearing specialist.

Note: In cases where the otoscopy is abnormal, the programme worker will evaluate whether the cause (e.g. wax, foreign body, other) can be resolved. Once resolved, the evaluation will be repeated.

If there is ear discharge, it is important that the programme worker mops the ear (see Annex 5) and provides suitable interventions and counselling *(12)*. More detailed information can be found in the WHO Primary ear and hearing care training manual *(10).* Once the ear problem has been addressed, the person can re-enter the programme and be reassessed for hearing aid fitting.

Step 2: Air conduction audiometry

After ensuring the absence of referral criteria, an air conduction audiometry should be performed. This should cover, at a minimum, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. Based on the audiometry results, the grade of hearing loss should be assessed according to the WHO hearing loss classification (see Annex 1).

- People with **moderate, moderately severe, and severe hearing loss** should go on to Step 3 – hearing aid fitting.
- People with **mild hearing loss** will be encouraged to receive annual hearing screening. Information or a suitable flyer about hearing protection and care

should be provided *(14)*. If a person with mild hearing loss feels the need for a hearing aid, this can be supplied following consultation with the programme supervisor, and providing there are sufficient resources.

- People with profound hearing loss will be referred to a predefined health facility or hearing specialist since they may require technologies or expertise not available in the programme. They should be counselled about the importance of following up with the referral at the earliest possible time. (Details of infrastructure and equipment required for hearing aid fitting are provided in Annex 6.)

Step 3: Hearing aid fitting

Once eligibility for a hearing aid has been confirmed (for a person with moderate to severe hearing loss and with no indications for referral), the person should be informed about the need for a hearing aid and the importance of using it. However, fitting should only occur with the person's consent. If a person declines the use of a hearing aid, they should be counselled about the importance of using one and to report back to the programme worker if they reconsider their decision.

Hearing aid fitting is to be carried out by the programme worker. The recommendation is to fit one ear (unilateral) with a preprogrammed/easy-to-fit hearing aid and a preshaped standard mould. However, the decision to use a unilateral versus a bilateral aid, and a standard versus custom-made mould will depend on the resources available.

With this service delivery approach, the recommendation is to fit one ear (unilateral) with a preprogrammed/easy-to-fit hearing aid and a preshaped standard mould.

Step 4: Counselling

Counselling is an important part of the hearing rehabilitation process. It should include providing the person with information relating to:

- the way their hearing aid works and the importance of using it regularly during waking hours;

- caring for their hearing aid in terms of:
  - keeping it in a safe, cool place when not using it, and away from water and heat at all times;
  - removing it while bathing or showering;
  - opening the battery drawer at night;
  - making sure it is switched off when not being used; and
  - cleaning the earpiece with a dry cloth every day.
- changing the batteries;
- common problems they may face when using a hearing aid and how to address these *(9)*; and
- general instructions for others on how to facilitate good communication with a person with hearing loss (see Box 1).

Counselling can be supported by mHealth tools where available and if culturally appropriate.

Box 1. Tips for good communication with a person with hearing loss

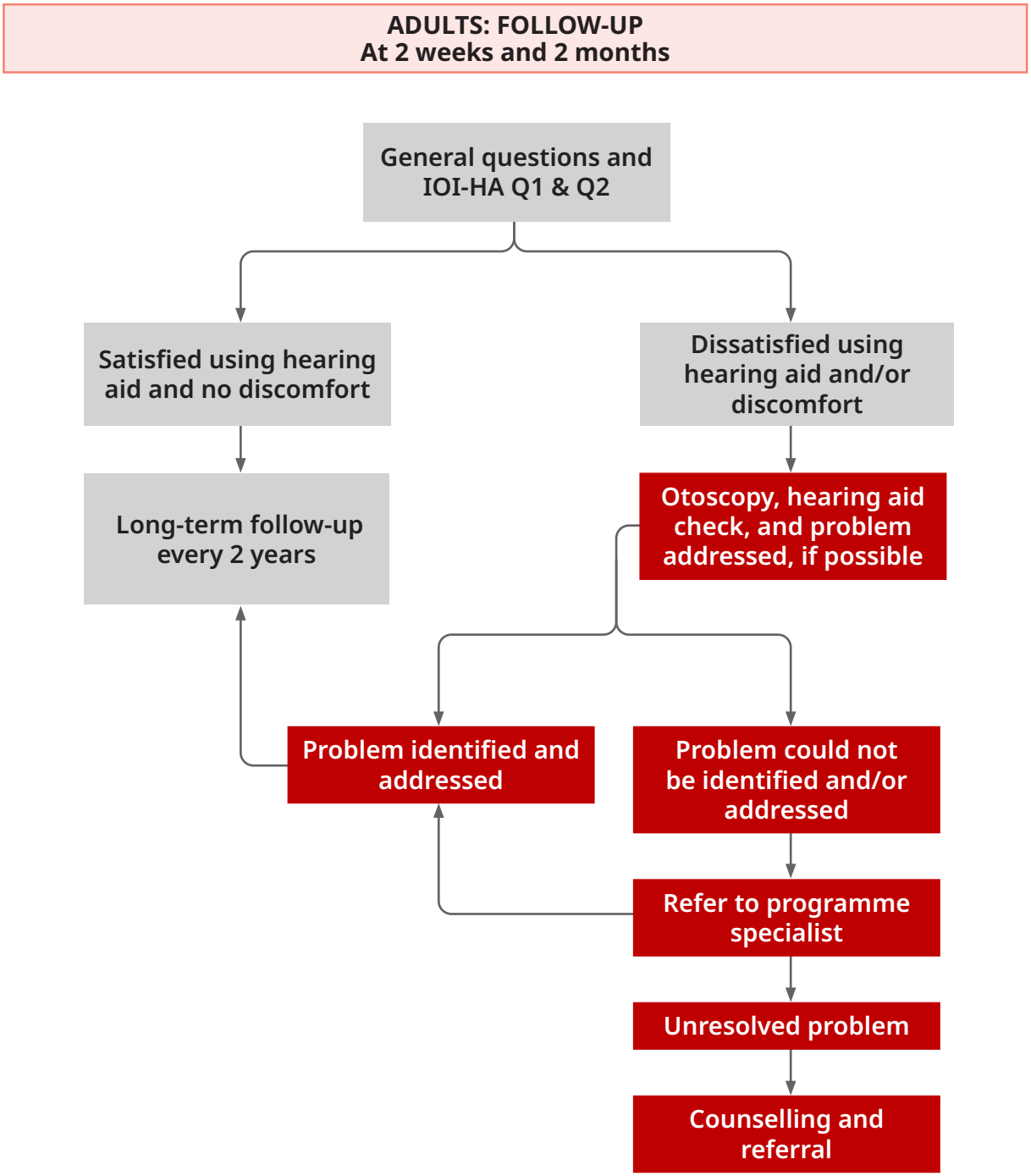
- Speak clearly and slowly. Don't shout!
- Stand in good lighting and face the person so the person can see your face when you speak.
- Do not exaggerate or distort lip movements when you speak.
- Try to keep background noise to a minimum, especially at work.
- Ensure people talk one at a time to facilitate listening by the person.

The WHO flyer on tips for hearing aids users *(9)* and the *Basic ear and hearing care resource (15)* are useful tools to support counselling. Further information on the training of programme workers is available in the WHO TAP module *(11)*.

2.5 First follow-up (two weeks after fitting)

The programme worker should make sure that every person with a hearing aid is followed up two weeks after the fitting. The steps taken in follow-up are illustrated in the Fig. 2 below.

Fig. 2. Service delivery approach for adults: follow-up



First follow-up can be conducted either **remotely** or **in person.** Every working team must choose the option that is most feasible, most acceptable to the person, and that best suits the characteristics of the setting.

Step 1: Questionnaire-based assessment (conducted remotely or in person)

A brief questionnaire is used to assess the use and benefit of hearing aids. This consists of:

- questions about the person's experience of their hearing aid, such as hours of use per day, performance, level of satisfaction, comfort, and problems.
- questions relating to the degree of improvement perceived by the user. This will be assessed with the first two questions of the International Outcomes Inventory – Hearing Aids (IOI-HA) (see Annex 3).

A sample follow-up questionnaire is provided in Annex 4. Responses are to be recorded. If the person does not report any specific issues or challenges, no further action is needed until the second follow-up two months after the fitting. At this stage, the responses to the IOI-HA questions are recorded for future reference, and can be used to counsel the person if needed.

Step 2: Ear examination and hearing aid check (in person; only if needed)

If a person reports discomfort or a problem with their hearing aid, they need to make an appointment with the programme worker for an in-person review. During this visit, the programme worker must:

- conduct an ear examination including otoscopy to look for wax accumulation or inflammation;
- check the hearing aid to see that:
  - all parts are intact
  - the batteries are correctly inserted and functioning
  - the hearing aid is working suitably.

Step 3: Addressing the issues (where required)

If a problem is identified during Step 2, it should be managed by the programme worker using the appropriate means. If needed, the programme worker should consult the programme supervisor.

Once the problem has been addressed, no further action is needed until the second follow-up, scheduled at two months after the fitting.

If a problem, for example related to the ear or hearing aid, cannot be identified or addressed by the programme worker, the issue should be managed through consultation with the programme supervisor. In some cases, the hearing aid may need to be replaced. Once the problem has been addressed, the user will need to return for a follow-up two months after fitting. The programme supervisor may, if needed, take the decision to further refer the person to the identified local referral centre.

Note: There is no set protocol for making appointments with the programme supervisor or for referral; these should be determined according to the person´s needs. The programme supervisor must conduct evaluations and necessary interventions as required for each person. Once the problem has been addressed, the user can return to the standard follow-up regime.

2.6 Second follow-up (two months after fitting)

As with the first follow-up, the second follow-up can also be conducted remotely, unless an in-person follow-up is preferred due to technological limitations or cultural reasons. During planning, the expert group should discuss and agree on the option that best suits the characteristics of the setting.

Steps to be followed in the second follow-up are the same as the first (see Fig. 2). During this, the programme worker will ask general questions regarding the use of the hearing aid and if there are any problems. Questions include numbers 1 and 2 of the IOI-HA (see Annex 3).

If no problems are reported and there is perceived benefit with use of the hearing aid, it will be necessary to:

- reiterate the information about general care of hearing aids and how to troubleshoot common problems *(9)*; and
- schedule the next follow-up appointment, two years after the hearing aid fitting.

If a problem is reported, the programme worker may try to address this remotely. In situations where the problem cannot be addressed remotely or there is a lack of perceived benefit with the hearing aid (as assessed by Questions 1 and 2 of the IOI-HA), or if the remote option is not feasible, the person should be asked to come to the facility for a face-to-face appointment.

Lack of benefit as assessed by the IOI-HA:

- Daily use below 4 hours
- Perceived benefit: not at all or slightly

In settings where the remote option is not feasible or if a problem is identified during remote follow-up that cannot be addressed, an in-person appointment will need to be scheduled. This will follow the same steps as those listed above for the first in-person follow-up.

2.7 Long-term follow-up (every two years, in person)

Every two years, the user is asked to report in person to the programme worker for follow-up. This follow-up should include:

- a questionnaire-based assessment (Annex 4);
- an ear examination and otoscopy *(10)* (see Annex 5);
- audiometry (this should be repeated during the two-year follow-up to identify any changes in the grade of hearing loss); and
- a hearing aid assessment and adjustment, if needed.

If a problem is identified (e.g. ear wax or blockage of hearing aid tubing etc.), this should be addressed by the programme worker. If it cannot be addressed, the programme supervisor should be informed and requested to resolve the issue.

In situations where problems cannot be solved by the programme staff, or there is an indication for referral, the person should be referred to the identified local specialist or health facility.

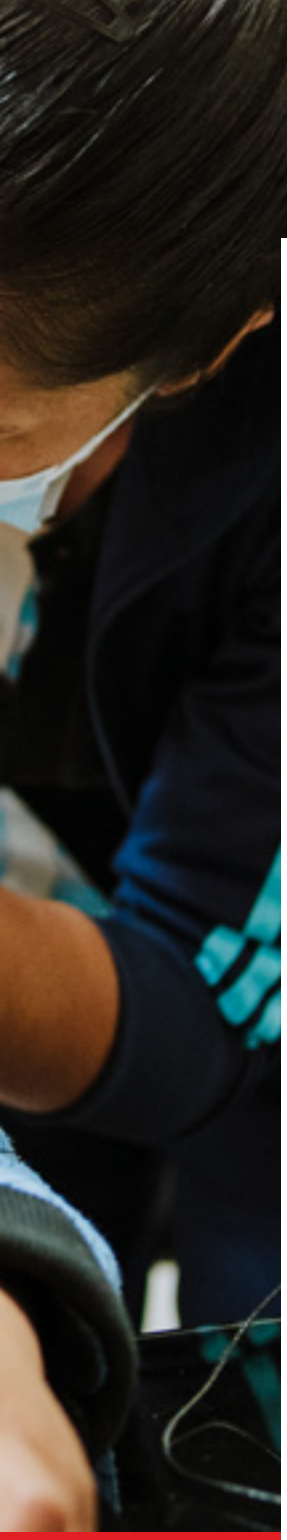
2.8 Appointments on demand

Although there is a clear regime for monitoring hearing aid users, this must be adapted to the needs of the population to be served. Users should be able to consult with the programme workers at any time if they have any problems with their hearing aid – for example with the tubing or ear mould, or if they experience an increase in hearing loss, an ear problem or any other issue.

The programme staff must consider ways in which users can report remotely (e.g. by phone message, email, or other) to arrange an in-person appointment, as needed.

© Oír para Crecer (OPC)

Collaborative action and training: the key to timely ear and hearing care for children: a case study from Peru



Daniela is 19 years old and lives in Ayacucho (a city in the Peruvian Sierra). She joined the Oír para Crecer (OPC) programme in 2017. Daniela was born extremely premature at five months as part of a high-risk pregnancy. At the age of three years, due to her language difficulties, she was diagnosed with hearing loss. She lives with her grandmother and had not used hearing aids until she contacted us. She has now been using hearing aids for six years, and thanks to these, she successfully completed school and is currently working and preparing to enter university.

In Peru, among the 32 million population, 248 728 people are reported to have hearing disabilities (INEI[3] 2017). The focus of the INEI 2017 survey on "visible" disabilities is likely to underestimate the true number, hindering responses in health, education, and child development. With only 14 audiologists in the capital city Lima, rural areas face challenges.

Since 2019, OPC has developed a hearing health programme in Peru: "Audiological model inside Peru". As a nonprofit programme, OPC aims to responsibly enhance access to hearing health. Despite challenges such as a shortage of audiologists and imprecise national statistics, OPC employs innovative technology and task-sharing for the effective diagnosis of hearing loss in children. More than 82 862 children and adults have been screened nationwide.

In addressing existing hearing loss, OPC's audiological clinic fitted 135 hearing aids in 2019, rising to 555 in 2022, with a projected 1000 by 2023, showcasing substantial growth. OPC strategically partners with local organizations, training 296 primary health workers for primary auditory care in six provinces (Cajamarca, Cusco, Huancayo, Huanuco, Lima and Pucallpa). Their support includes the use of tele-audiology, enhancing accessibility, building capacities, and providing trained primary health care workers. In conclusion, OPC bases its audiological model on three pillars: i) prevention through hearing screenings; ii) diagnosis and rehabilitation by fitting hearing aids supported by trained primary health care workers; and iii) empowerment of local partners through the training of local technicians.

Case study provided by Rosario Urdanivia Morales, Audiologist and Director of Oír para Crecer, Peru

3 The INEI is the National Institute of Statistics and Information (Instituto Nacional de Estadística e Informática National) of Peru.

3 Hearing aid service delivery approach for children

3.1 Objective

The **objective** of this service delivery approach is to promote access to hearing rehabilitation using affordable, high-quality, easy-to-fit hearing aids suitable for children aged five years or older who have post-lingual mild to moderately severe hearing loss without middle ear disease. The proposed model can be used in low- and middle-income settings, especially when easy access to specialized audiology services is lacking. When establishing a hearing aid service for children it is important to consider the points listed in Box 2 below.

Box 2. Establishing a hearing aid service for children: points to consider

- While the need for hearing aids is seen less frequently in children than in adults, early hearing rehabilitation significantly impacts a child's development and education.
- Compared to adults, hearing aid fitting in children is often more demanding and requires a higher level of training for the programme worker and greater supervision by the programme specialist.
- Ear diseases, such as chronic otitis media, are commonly encountered in children, especially those in the younger age group (aged 5–12 years). Care must be taken to correctly refer any child identified with an ear disease for the appropriate management of the problem.
- The decision to provide a hearing aid to a child identified with an ear disease should be made only by the programme specialist and on a case-by-case basis.
- Children below the age of five years, and children with pre-lingual or severe to profound hearing loss, require consultation and management with a specialist; their needs cannot be addressed solely through a community-based approach.

- When setting up this service, it is important to ensure that there are suitable health facilities or service providers available when referring children for specialist intervention.
- While the use of hearing aids, where indicated, is highly recommended, the decision taken by the parent/caregiver on behalf of the child should not be forced, and whatever is decided must be respected.

Note: It is essential to follow the principles outlined in section 2 – Hearing aid service delivery for adults, to ensure the service causes no harm in the community nor perpetuates stigma related to hearing loss or the use of hearing aids. Implementers of the programme should carefully review these issues along with the approach below.

3.2 Indications for referral

As defined in the implementation protocol, if at any point during the assessment or follow-up, problems are encountered, the parent/care giver should be counselled, and the child referred to a doctor or hearing care specialist. Complaints may include:

a. severe, profound, or pre-lingual hearing loss;

b. agenesis or severe malformation of the external auditory canal;

c. ear trauma;

d. history of acute pain, active drainage, or bleeding from an ear;

e. recurrent or chronic otitis media;

f. dry perforation of the tympanic membrane;

g. sudden onset or rapidly progressive hearing loss;

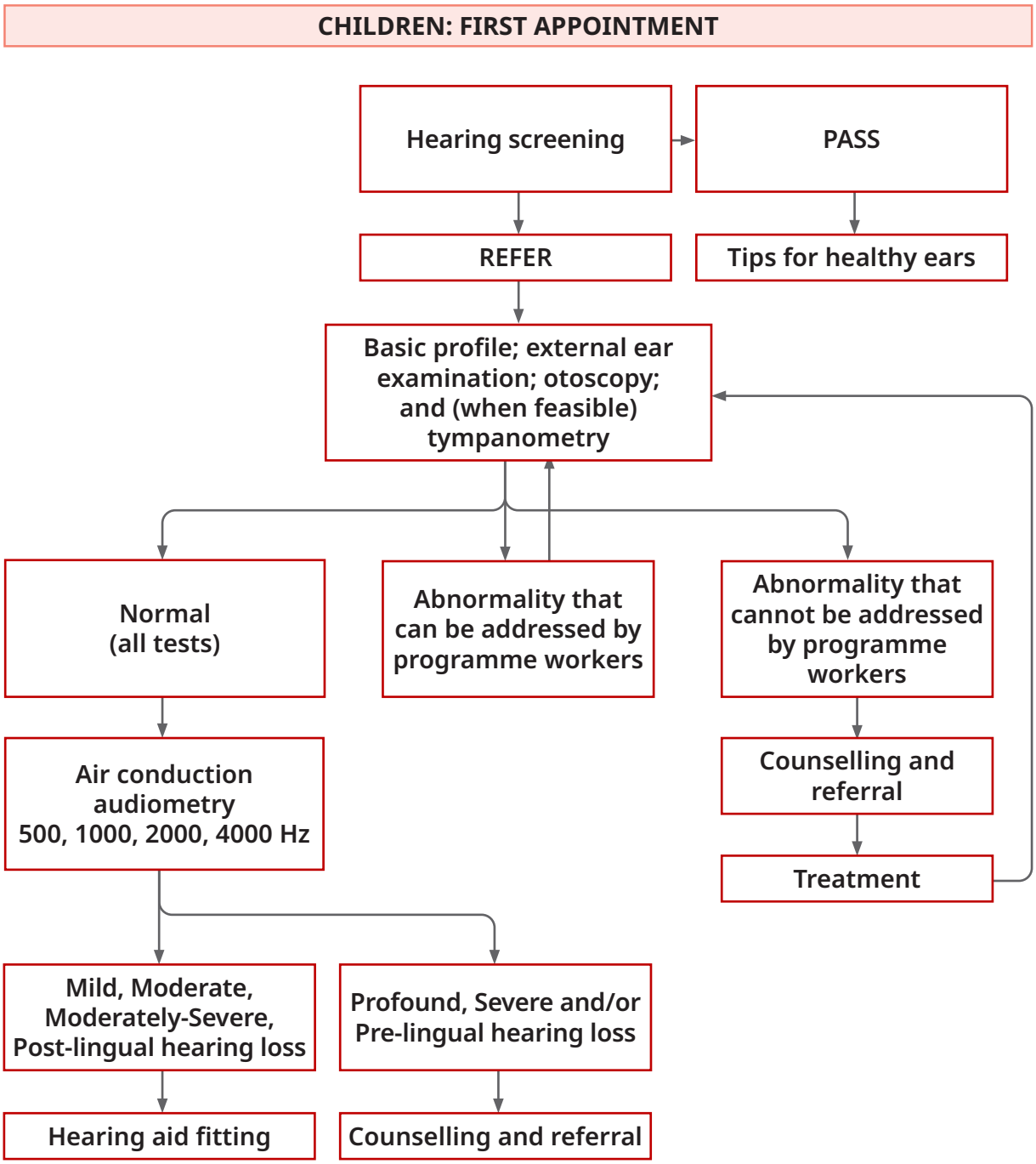
h. pulsatile tinnitus; and

i. child not able to follow instruction (e.g. in cases of multiple disabilities).

3.3 Steps for hearing aid service delivery for children

Entry into a programme can be through a community- or school-based screening programme, referral from another health facility; or through parental/caregiver concern about the child's hearing (self-referral). The flow chart provided in Fig. 3 gives an overview of steps to be taken with this approach.

Fig. 3. Service delivery approach for children: first appointment



3.4 First appointment

Step 1: Hearing screening

Prior to a full assessment, children can first be screened to determine the need for progression to subsequent steps. Such a screening can be done through a sweep audiometry at a fixed decibel level or through a digits-in-noise test (for children over nine years). More details can be found in the WHO handbook titled Hearing screening: considerations for implementation.

Children that fail the screening in one or both ears should receive a full assessment as described in Step 2.

Step 2: Basic profile, ear examination including otoscopy and tympanometry (optional)

The next step is for the programme worker to ask the child/parent/caregiver questions to record demographic information and to take a brief history. A sample questionnaire that can be used for this purpose is provided in Annex 4. A note must be made of the onset of hearing loss and whether it was pre- or post-lingual.

This is to be followed by an examination of both ears including an otoscopy. Details of the otoscopy technique are provided in Annex 5 as well as the WHO Primary ear and hearing care training manual *(10)* and the WHO TAP module for hearing aids *(11).*

Wherever feasible, tympanometry should be performed to rule out middle ear pathologies. If this is not feasible, the assessment must be based on clinical examination and otoscopy, and opinion sought from the programme supervisor when needed. If required, the child should be referred for management of hearing loss or ear disease to an identified and appropriate health facility.

Following the history taking and ear examination:

- If there are no symptoms or signs matching the referral criteria, the child can advance to Step 3 (audiometry).
- If wax or foreign body is identified in the ear canal, this can be removed by the programme worker either at the time or at a subsequent visit. Once resolved, the ear examination should be repeated. If there are any doubts or difficulties in examining the ear, the programme worker should seek advice from the programme specialist.
- If any of the indications for referral are identified, the child should be referred for evaluation to the pre-identified health facility or hearing specialist.

Note: If the otoscopy or tympanometry is abnormal (e.g. showing the presence of wax, foreign body, or other), the cause can be evaluated and resolved by the programme worker. Once resolved, evaluation must be repeated.

In cases where there is ear discharge, it is important that the programme worker mops the ear *(10)* (see Annex 5), and provides suitable intervention and counselling to the child/parent/caregiver *(12)* (see Annex 7). Further information is provided in the WHO Primary ear and hearing care training manual *(10)*. Once the ear problem has been addressed, the child can re-enter the programme and be reassessed for hearing aid fitting.

Step 3: Air conduction audiometry

After ensuring absence of referral criteria, an air conduction audiometry should be performed. This should cover, at a minimum 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. Based on the audiometry results, the grade of hearing loss should be assessed according to the WHO hearing loss classification (see Annex 1).

- Children with **mild, moderate or moderately severe hearing loss that is post-lingual** in origin should go on to Step 4 – hearing aid fitting.
- Children with **severe or profound hearing loss and/or pre-lingual hearing loss** (of any degree) must be referred to the pre-identified health facility or local hearing specialist since they may require technologies or expertise not available in the programme. The parent/caregiver should be counselled about the importance to the child of following up with the referral. The referral must be scheduled at the earliest possible time.

Step 4: Hearing aid fitting

Once eligibility for hearing aid is decided (mild, moderate or moderately-severe hearing loss, post-lingual in onset and without any indications for referral), the child/parent/caregiver should be informed of the need for a hearing aid and the importance of using it. However, fitting should only occur with the consent of the parent/caregiver. If a parent/caregiver declines the use of a hearing aid for the child, they should be counselled to report back if and when they reconsider their decision.

Hearing aid fitting is to be carried out by the programme worker. With this approach, the recommendation is to fit one or both ears, depending on whether the hearing loss is unilateral or bilateral, with easy-to-fit hearing aids and preshaped standard moulds. There should be an option to provide custom-made moulds, where these are considered necessary. The decision to use a standard versus a custom-made mould can be made in consultation with the programme supervisor and will depend on the resources available.

With this approach, depending on whether the hearing loss is unilateral or bilateral, the recommendation is to fit one or both ears, with easy-to-fit hearing aids and preshaped standard moulds.

Step 5: Counselling

Counselling is an important part of the hearing rehabilitation process. It should include providing the child/parent/caregiver with information related to hearing aids, such as:

- the way a hearing aid works and the importance of the child using it regularly during waking hours;
- caring for the hearing aid in terms of:
  - keeping it in a safe, cool place away from water and heat when it is not being used;
  - making sure it is removed when bathing or showering;
  - opening the battery drawer at night;
  - making sure it is switched off when it is not being used; and
  - cleaning the earpiece with a dry cloth every day.
- changing the batteries when necessary; and
- **keeping the batteries in a safe place. The child should not handle the batteries.**
- General instructions for communication with the child (as indicated in **Box 3**).

Note: Where considered necessary, such as in tropical areas, a dehumidifier should also be provided, and instructions given for its use.

Box 3. Tips for good communication with a hearing-impaired child

At home

- Speak clearly and slowly. Don't shout!
- Stand in good lighting and face the child so that they can see your face when you speak.
- Do not exaggerate or distort lip movements when speaking.
- Avoid speaking to the child in noisy environments; try to keep noise to a minimum.
- Ensure people talk one at a time to facilitate listening by the child.

In school

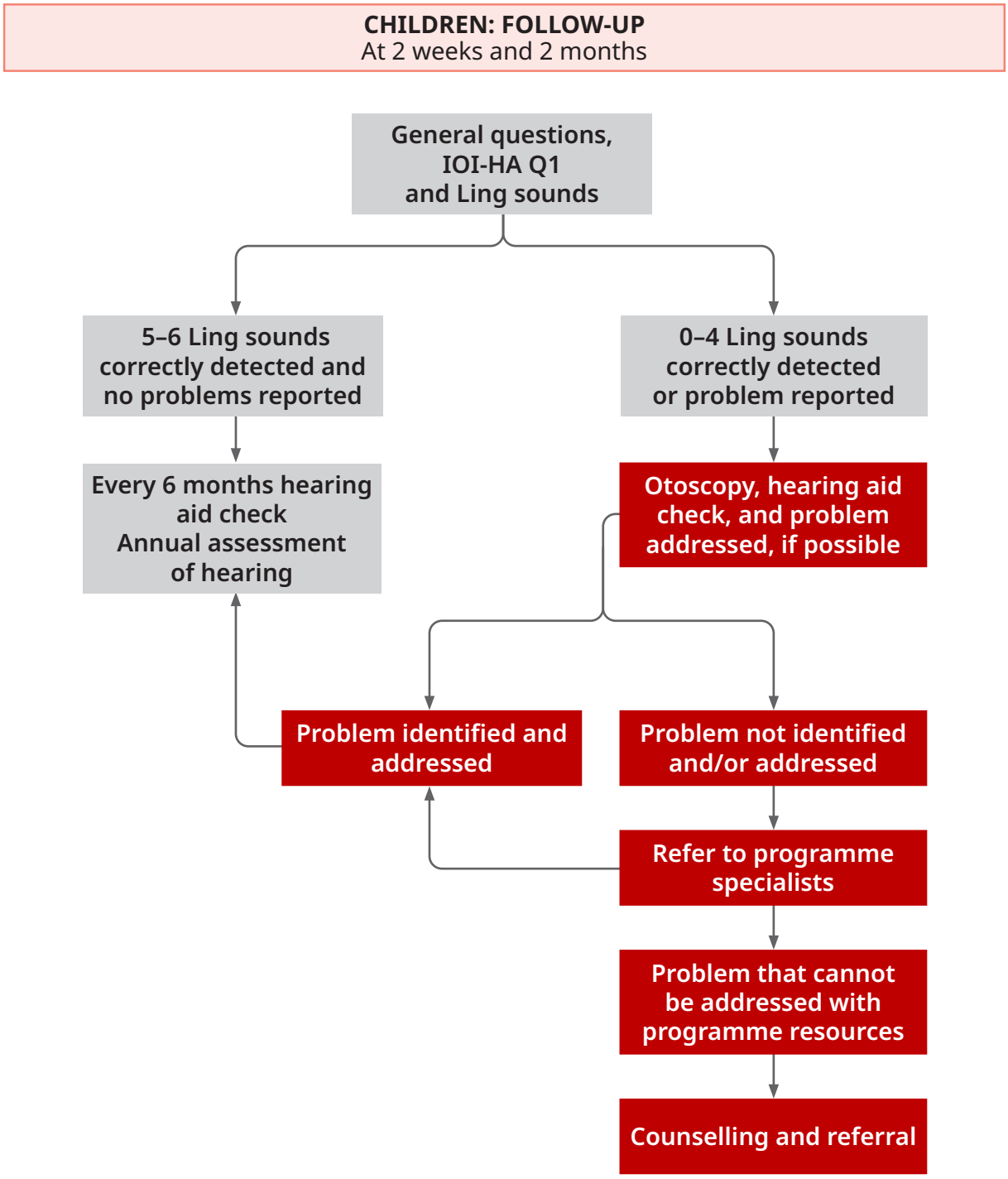
- Encourage the child to advocate for himself/herself especially when they are having difficulty coping with class activities.
- Provide appropriate seating and try to reduce noise in the classroom.
- Implement communication strategies to accommodate the child's communication needs (e.g. provide course materials in advance; give instructions both verbally and in writing; use visual aids during class, etc.).
- When available, a Special Education Teacher should provide strategies that are culturally appropriate and scientifically sound to optimize the child's performance in school
- Teaching parents/caregivers and teachers how to perform a daily listening check before and after putting the hearing aid on the child.
- Use hearing aid clips or retention cords to prevent the hearing aid from falling off or getting lost.

The WHO flyer on tips for hearing aids users *(9)* and the *Basic ear and hearing care resource (15)* are useful tools to support counselling. More details about the training of the programme workers is provided in the WHO TAP module *(11).*

3.5 First follow-up (in person, two weeks after fitting)

The programme worker should make sure that every child fitted with hearing aids is followed up in person two weeks after fitting. The steps taken in follow-up are outlined below in Fig. 4.

Fig. 4. Service delivery approach for children: follow-up



Step 1a: Questionnaire-based assessment

A brief questionnaire is used to assess the use and benefit of hearing aids. The child/parent/caregiver should be asked a few simple questions, including about the child's experience with the hearing aid – for example the hours of use per day, performance, level of satisfaction, comfort, and problems.

A suggested follow-up questionnaire is provided in Annex 4 with Question 1 of IOI-HA being asked (see Annex 3). Responses are to be recorded. Following this, a Ling sound test must be conducted to assess the benefit of using the hearing aid/s (Annex 2).

Step 1b: Ling sounds test

The Ling sound test is a behavioural test to determine the effectiveness of the hearing aid. The Ling sounds test should be performed as indicated in Annex 2. The child's response to the Ling sounds test is recorded and used for comparison with earlier tests during the subsequent visits.

Parents/caregivers will be taught by the programme worker how to perform the test with the child at home and to report the results for a remote follow-up.

If the child/parent/caregiver does not report any specific issues or challenges with use of the hearing aid, and if the child identifies five or more Ling sounds correctly, no further action is needed until two months after fitting, when the second follow-up is to be scheduled.

Step 2: Ear examination and hearing aid check (only if needed)

In cases where there are reports of discomfort, a problem with the hearing aid, or recognition of four or fewer Ling test sounds, the following should be conducted:

- Ear examination including otoscopy to look for wax accumulation or inflammation. If tympanometry is included in the test protocol, this should also be performed.
- Check hearing aids to ensure that:
  - all parts are intact;
  - the batteries are correctly inserted and functioning; and
  - the hearing aid is working as required

Step 3: Addressing the issues (only if needed)

When a problem is identified, it should be managed by the programme worker through the appropriate means.

Once the problem has been addressed, no further action is needed until the second follow-up, which is to be scheduled two months after fitting.

If a problem cannot be identified or resolved by the programme workers, the programme supervisor should be consulted, and the problem addressed in consultation. Problems may relate to the ears, or technical issues with the hearing aid. In some cases, the hearing aid may need to be replaced. Once the problem has been addressed, and when the specialist gives the indication, the parent/caregiver must be asked to bring the child for follow-up two months after fitting. The programme specialist may, if needed, take the decision to further refer the child to an identified local specialist or health facility (ideally a specialized audiology centre).

Note: Appointments with the programme supervisor, if necessary, should be determined according to the child´s needs and decided by the specialist. The programme supervisor carries out the evaluations and necessary interventions as required by the child. Once the problem is resolved, the child can return to the standard follow-up regime.

3.6 Second follow-up (two months after fitting)

The second follow-up can be conducted remotely, unless an in-person follow-up is preferred due to technological limitations or cultural reasons. Every working group must choose the option that best suits the characteristics of their setting.

Second follow-up (if conducted remotely)

During this follow-up, the programme worker will:

- ask the child/parent/caregiver general questions regarding the use of the hearing aid and if there have been any problems. Include Question 1 of IOI-HA (see Annex 3 and 4);
- ask the parents to perform the Ling sounds test with the child and to inform the programme worker of the outcome (see Annex 2).

If no problem is reported, the programme worker should reiterate the information on the general care of hearing aids and how to troubleshoot common problems. An appointment will need to be arranged for the next in-person follow-up, which should take place a year after fitting.

If there is a problem which cannot be addressed remotely, or if the remote option is not feasible, the parent/caregiver should be asked to bring the child to the facility for a face-to-face appointment.

Second follow-up (if conducted in person)

In settings where the remote option is not feasible or if a problem is identified during remote follow-up that could not be addressed, an in-person appointment is scheduled. This will follow all the steps of the first follow-up, i.e. steps 1a and 1b, and, if needed, steps 2 and 3 and address problems in a similar manner (see Fig. 4).

3.7 Long-term follow-up

Every six months (for hearing aid maintenance)

Every six months the parent/caregiver should be asked to bring the child's hearing aid/s to be checked. This can be a device-only check if the child is unable to attend. The programme worker will clean and assess the functioning of the hearing aid. A tube, mould and/or other supplies will be changed or provided, as needed.

Every year (in-person)

Every year, the parent/caregiver must bring the child to the facility for an in-person follow-up with the programme worker. This follow-up should include:

- a questionnaire-based assessment (Annex 4);
- an ear examination and otoscopy;
- a Ling sounds test;
- a hearing aid assessment and adjustment, as needed;
- an air conduction audiometry (this should be repeated one year after hearing aid fitting and then annually to identify any changes in the degree of hearing loss);
- where any problem is identified (e.g. ear wax or blockage of hearing aid tubing etc.), this should be addressed by the programme worker. Where it cannot be addressed, this should be discussed with or referred to the programme specialist for management.
- where problems faced cannot be addressed by the programme supervisor, or if there is any indication for referral, the child should be referred to the identified local specialist/health facility.

3.8 Appointments on demand

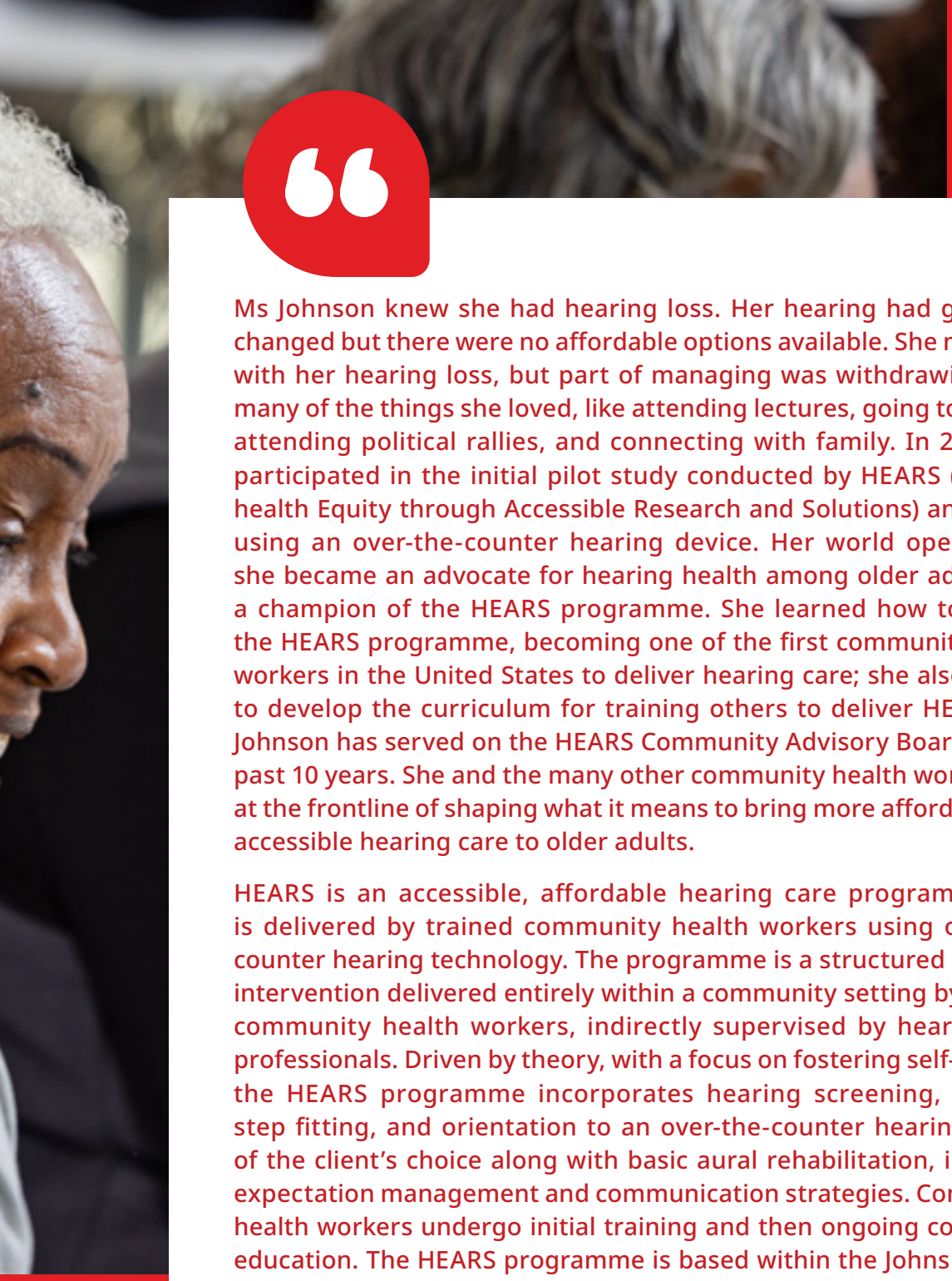
Hearing aid users should be able to consult with programme workers at any time in the event of a problem with the hearing aid such as with its tubing or ear mould, increase in hearing loss, ear problem or other issues.

The programme must consider a way to report remotely (via phone or text message, email, or other), when required and to seek in-person appointment as needed.

© Carrie Neiman

Low resource settings with limited access to care in high income countries:

a case study from the United States of America



Ms Johnson knew she had hearing loss. Her hearing had gradually changed but there were no affordable options available. She managed with her hearing loss, but part of managing was withdrawing from many of the things she loved, like attending lectures, going to church, attending political rallies, and connecting with family. In 2014, she participated in the initial pilot study conducted by HEARS (Hearing health Equity through Accessible Research and Solutions) and began using an over-the-counter hearing device. Her world opened and she became an advocate for hearing health among older adults and a champion of the HEARS programme. She learned how to deliver the HEARS programme, becoming one of the first community health workers in the United States to deliver hearing care; she also helped to develop the curriculum for training others to deliver HEARS. Ms Johnson has served on the HEARS Community Advisory Board for the past 10 years. She and the many other community health workers are at the frontline of shaping what it means to bring more affordable and accessible hearing care to older adults.

HEARS is an accessible, affordable hearing care programme that is delivered by trained community health workers using over-the-counter hearing technology. The programme is a structured 1–2 hour intervention delivered entirely within a community setting by trained community health workers, indirectly supervised by hearing care professionals. Driven by theory, with a focus on fostering self-efficacy, the HEARS programme incorporates hearing screening, step-by-step fitting, and orientation to an over-the-counter hearing device of the client's choice along with basic aural rehabilitation, including expectation management and communication strategies. Community health workers undergo initial training and then ongoing continuing education. The HEARS programme is based within the Johns Hopkins Cochlear Center for Hearing and Public Health in the Johns Hopkins Bloomberg School of Public Health.

A nonprofit organization, Access HEARS, based in Maryland, USA operates in a complementary fashion to the academically based HEARS programme within Johns Hopkins. Access HEARS has served over 2000 clients and operates in partnership with departments of health and ageing locally and regionally.

Case study provided by Carrie Nieman, Associate Professor of Otolaryngology – Head and Neck Surgery, Johns Hopkins School of Medicine, USA

4 Considerations for implementation

Before putting into practice the service delivery approaches, it is important to develop **a local implementation protocol**. The approach to the local context and plan will need to be adapted to the laws and regulations of the country, human and material resources required, including training for members of the programme team and other relevant considerations. In this section, reference will be made to the different aspects to consider before starting the programme.

Any intervention that is put in place should consider the individual access needs of the various population groups such as older adults and children.

4.1 Planning

A steering committee, led ideally by the Ministry of Health, consisting of a panel of national or local experts and stakeholders, including individuals with hearing loss, as well as community health workers, should systematically discuss and plan for hearing aid service provision in the area. The epidemiology of hearing loss and ear diseases within the country or region should be taken into consideration, as should current policies for ear and hearing care, rehabilitation and assistive technologies, where relevant.

The hearing aid service delivery programme should be part of an overall government-led national, subnational, or regional strategy for strengthening ear and hearing care and embedded within the health system.

The steering committee must carefully review the principles and approaches for hearing aid service delivery as outlined in this document. The committee should then consider the implementation of the programme in terms of the local context, adapting it or elaborating on it if necessary, particularly with respect to:

- the social, cultural and/or economic conditions of where the programme is to be implemented;
- the location of the programme; e.g. the type of facility hosting the hearing aid fitting;
- human resources; based on the available health cadres, the committeee must determine the most suitable cadre to be trained as programme workers, and to serve as programme supervisors;
- service delivery steps, including follow-up. The committee should carefully consider whether remote or in-person follow-up would be most suitable. Modalities for remote follow-up should be clearly identified;
- referral criteria which should be finalized, and referral pathways clearly defined;
- training materials from WHO *(10)* which should be reviewed and the training plan developed; and
- accompanying awareness materials and resources to be reviewed for use in the local context. Changes can be made to these, after informing and seeking agreement from WHO at: whf@who.int.

Note: The principles listed in section 1, General framework, should be carefully adhered to during the adaptation and implementation process.

4.2 Policy and finance

1. As far as possible, hearing aid service delivery should be part of an overall government-led national, subnational, or regional strategy for strengthening ear and hearing care. The approach for hearing aid service delivery should be embedded within the health system and have the necessary regulatory or legal support from the authorities.

   It is important that national and regional policies support an appropriate scope of practice to facilitate partnering with community health workers in delivering hearing care. Such policies should also support the certification of community health workers in delivering hearing care to bolster safety and quality.

   Financial resources for planning, piloting and implementing the programme must be made available.

4.3 Human resources and training requirements

The programme team should consist of:

1. Programme workers

Programme workers are to be non-specialists (such as community health workers) who deliver services previously provided by fully trained specialists. They can be under the supervision of an ear and hearing care specialist who has a thorough understanding of the approaches and implementation protocol. After training, programme workers are to carry out the specific tasks of the programme. The training of non-specialists should follow a competency-based curriculum that is responsive to the needs of the programme. Training should culminate in a formal evaluation prior to beginning practice. Once certified, programme workers should be monitored through defined quality measures and skills and assessed on an ongoing basis. It is expected that programme workers receive continued education and support beyond their initial training.

Programme workers will be responsible for:

- the initial assessment of a person, including history-taking, ear examination, audiometric assessment, and if available, tympanometry;
- treating common ear problems such as wax impaction and aural foreign body;
- fitting hearing aids using high-quality easy-to-fit hearing aids that align with WHO's recommended specifications;
- the identification of referral criteria, followed by counselling and referral;
- counselling of those with hearing loss in the use of hearing aids and providing tips for optimal communication;
- following up, at the appropriate time-points, people who have been identified with hearing loss, ear diseases and those fitted with hearing aids;
- addressing common issues or problems related to hearing aids, such as blocked tubing, battery change, change of ear tips etc; and
- maintaining records and preparing a report based on identified indicators.
- Useful resources for the training of programme workers include WHO's *Primary ear and hearing care: training manual (10)* and the *Training on assistive products (TAP) – hearing aids module (11)*.

2. Programme supervisor

The programme should be undertaken with the overall supervision and guidance of an ear and hearing care professional such as an audiologist, otolaryngologist or other cadre that provides hearing aid fitting and hearing care in the country. Programme supervisors must be trained in supervising programme workers in the delivery of hearing care and be responsible for their continued education and ongoing assessment. The programme supervisor will be responsible for:

- providing training and ongoing supervision to the programme workers;
- providing technical support to the programme workers, especially for the assessment of complex cases that meet the referral criteria, or cases that require expert opinion to continue the rehabilitation process with hearing aids; and
- ensuring quality control through supervision and random checks.

Training and supervision can be conducted by the supervisor either in the field or by using telehealth tools if they are available.

The number of programme workers in any location depends on the size of the population served and prevalence of hearing loss. The numbers required should be decided during the planning stage.

4.4 Equipment and infrastructure requirements

The programme is designed to be implemented with the minimum infrastructure and equipment necessary to ensure quality care. It can be adapted according to the resources available in the setting.

Minimum infrastructure includes the provision of a quiet room that allows hearing assessment and face-to-face appointments during follow-up. Equipment required depends on the population to be served (adults or children) and tests included. A list of infrastructure and equipment requirements is included in Annex 6.

4.5 Referral pathway

The referral pathway must be clearly defined for those requiring referral. The name or type of health facility should be clearly indicated in the implementation protocol prior to starting the service delivery, and linkages created so that the persons referred can access the care and services they need without facing undue hardships. Linkages include those with primary health care doctors for the management of common ear diseases such as otitis externa or otitis media, as well as with specialist centres or health facilities that provide specialized audiology or

otology services. The person's referral form or referral slip must indicate where, when and to whom they should report. As far as possible, facilities should be easily accessible without the need for the person to travel long distances or incur out-of-pocket expenses. All referral details relating to time, date, venue, and clinician should be provided in writing.

4.6 Follow-up and counselling

Follow-up should be undertaken actively, especially for those fitted with hearing aids; particular consideration should be given to children and older adults. Counselling should be provided throughout the service delivery process, i.e. before, during and after fitting. Counselling must also be provided in cases of referral and be available for all users at any time if needed. Details of the next appointment, including time, date, venue, and clinician, should be provided in writing.

4.7 Data management

All information on hearing aid users constitutes a health record and must be confidential. Nonetheless, it is particularly important that the data recording system allows the programme team to easily access both the demographic and contact information of the person, as well as their hearing assessment, otoscopy, hearing aid performance or other technical aspects. Maintaining an orderly and complete database is strongly recommended to facilitate the work of the team.

4.8 Indicators

The following indicators are proposed for consistent data collection and monitoring

- Hearing loss diagnosis:
  Number of new cases diagnosed with hearing loss/Total number of first visits to the ear and hearing care services x 100.
- Effective coverage of hearing aids use among adults with hearing loss: Number of adults in a defined population having a perceived benefit through the use of hearing aids/Adults with hearing loss (moderate to severe) in the defined population x 100.
- Access to hearing technologies:
  Number of cases with hearing loss fitted with hearing technologies/Total number of new diagnoses of hearing loss x 100.

- Follow-up after hearing technology fitting:
  Number of cases fitted with hearing technologies with at least 1 follow-up session within 6 months of fitting/Total number of cases fitted with hearing technologies x 100.

Programmes should also gather information on the costs and time required by programme staff to aid continued refinement and future expansion of such programmes.

Clarification and technical support for the adaptation and implementation of the hearing aid service delivery approach can be sought by contacting the relevant WHO country office or by writing to: whf@who.int.

References

1. World report on hearing. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/339913, accessed 1 October 2023).
2. Orji A, Kamenov K, Dirac M, Davis A, Chadha S, Vos T. Global and regional needs, unmet needs and access to hearing aids. Int J Audiol. 59(3):166–172.
3. GBD 2019 Hearing Loss Collaborators. Hearing loss prevalence and years lived with disability, 1990–2019: findings from the Global Burden of Disease Study 2019. Lancet. 2021;397(10278):996–1009. doi:10.1016/S0140–6736(21)00516-X.
4. McDaid D, Park AL, Chadha S. Estimating the global costs of hearing loss. Int J Audiol. 2021 Mar;60(3):162–170. doi: 10.1080/14992027.2021.1883197.
5. World Health Assembly resolution WHA70.13. Prevention of deafness and hearing loss; 2017 (https://iris.who.int/handle/10665/275682, accessed 1 October 2023).
6. World Health Assembly resolution WHA71.8. Improving access to assistive technology; 2018 (https://iris.who.int/handle/10665/279511, accessed 1 October 2023).
7. A market landscape and strategic approach to increasing access to hearing aids and related services in low and middle income countries. ATscale Global Partnership for Assistive Technology; 2019 (29b7cf3cc7/1583162651132/PN-HearingAids_final.pdf, accessed 1 October 2023).
8. Preferred profile for hearing-aid technology suitable for low- and middle-income countries. Geneva: World Health Organization; 2017 (https://iris.who.int/handle/10665/258721, accessed 1 October 2023).
9. Tips for hearing aids users. Geneva: World Health Organization; 2023 (https://cdn.who.int/media/docs/default-source/ncds/sdr/deafness-and-hearing-loss/0123-tips-for-hearing-aid-users-flyer.pdf?sfvrsn=96b161cf_20&download=true, accessed 1 October 2023).
10. Primary ear and hearing care: training manual. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/366334, accessed 2 October 2023).
11. Training on assistive products (TAP): hearing aids module. World Health Organization; 2023 (https://www.who.int/teams/health-product-policy-and-standards/assistive-and-medical-technology/assistive-technology/training-in-products, accessed 1 October 2023).

12. Care of discharging ears. Geneva: World Health Organization; 2023 (https://cdn.who.int/media/docs/default-source/ncds/sdr/deafness-and-hearing-loss/0123-care-of-discharging-ears.pdf?sfvrsn=d8c071b0_16&download=true, accessed 2 October 2023).
13. Package of interventions for rehabilitation. Module 6: sensory conditions. Geneva: World Health Organization; 2023 (https://www.who.int/publications/i/item/9789240071223, accessed 2 October 2023).
14. Tips for healthy ears. Geneva: World Health Organization; 2023 https://www.who.int/publications/m/item/community-resource-5-tips-for-healthy-ears, accessed 2 October 2023).
15. Basic ear and hearing care resource. Geneva: World Health Organization; 2020 (https://www.who.int/publications/i/item/9789240001480, accessed 2 October 2023).

Annex 1
Grades of hearing loss[4]

Hearing loss is classified according to severity.

Grade	Hearing threshold* in better hearing ear in decibels (dB)	Hearing experience in a quiet environment for most adults	Hearing experience in a noisy environment for most adults
Normal hearing	Less than 20 dB	No problem hearing sounds.	No or minimal problem hearing sounds
Mild hearing	loss 20 to < 35 dB	Does not have problems hearing conversational speech	May have difficulty hearing conversational speech
Moderate hearing loss	35 to < 50 dB	May have difficulty hearing conversational speech	Difficulty hearing and taking part in conversation
Moderately severe hearing loss	50 to < 65 dB	Difficulty hearing conversational speech. Can hear raised voices without difficulty	Difficulty hearing most speech and taking part in conversation
Severe hearing loss	65 to < 80 dB	Does not hear most conversational speech. May have difficulty hearing and understanding raised voices.	Extreme difficulty hearing speech and taking part in conversation
Profound hearing loss	80 to < 95 dB	Extreme difficulty hearing raised voices	Conversational speech cannot be heard
Complete or total hearing loss/deafness	95 dB or greater	Cannot hear speech and most environmental sounds	Cannot hear speech and most environmental sounds
Unilateral locating sounds	< 20 dB in the better ear, 35 dB or greater in the worse ear	May not have problem unless sound is near the poorer hearing ear	May have difficulty in locating sounds. May have difficulty hearing speech and taking part in conversation, and in locating sounds

* Hearing threshold refers to the minimum sound intensity that an ear can detect as an average of values at 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz in the better hearing ear.

[4] *Source*: World report on hearing. Geneva: World Health Organization; 2021.

NOTE:

The above classification and grades are for epidemiological use and applicable to adults. The following points must be kept in mind while applying this classification:

- While audiometric descriptors (e.g. category, pure-tone average) provide a useful summary of an individual's hearing thresholds, they should not be used as the sole determinant in the assessment of disability or the provision of intervention(s), including hearing aids or cochlear implants.
- The ability to detect pure tones using earphones in a quiet environment is not, in itself, a reliable indicator of hearing disability. Audiometric descriptors alone should not be used as the measure of difficulty experienced with communication when there is background noise, the primary complaint of individuals with hearing loss.
- Unilateral hearing loss can pose a significant challenge for an individual at any level of asymmetry. It therefore requires suitable attention and intervention based on the difficulty experienced by the person.

Annex 2
Ling sounds test

Daniel Ling created the Ling Sound Test that is an auditory assessment tool published in 1976 (Speech and the Hearing-Impaired Child: Theory and Practice Ling, 1976). The objective is to use a range of speech sounds that represent the speech spectrum using isolated phonemes to target low, middle, and high-frequency sounds. Ling's sounds are [m], [ah], [oo], [ee], [sh] and [s]. The test is used for checking detection (recognizing the presence or absence of sound), discrimination (discerning if two or more sounds are the same or different), and identification (reproducing a sound or pointing to a picture of the sound heard) of sounds.

A wide range of people can use this tool including classroom teachers and parents. It is a quick and accurate assessment tool that can be used to evaluate the outcome of hearing devices and with no amplification at all. It can be used for a wide range of ages or needs. The Ling Sound Test is used worldwide.

Instructions:

1. Verify the child's hearing aids are on and set at the appropriate settings.
2. If this is the first time the child completes the task, demonstrate what is expected.
3. Position the listener 1 metre from you, sit beside him/her and ask the child to "listen."
4. Use an auditory screen and hold it about 10 cms (about 3.94 in) in front of your mouth so your mouth is completely covered. Make sure you are not providing any visual cues such as raising your eyebrows or other facial movements and that the child cannot lipread.
5. Using a normal conversational level, present each of the sounds through listening alone.
6. Each of the sounds should be presented for the same length of time without rising or falling pitch.
7. After presenting each sound, wait for the child to respond.

8. Occasionally say nothing while doing the test. This way, a listener learns that it is okay to say that he/she does not hear anything.
9. Remember to present the Ling Sounds in a random order so the child does not learn the pattern of presentation.
10. Present all six sounds at least three times randomly. Vary the length of your pauses.
11. If the child can detect the sounds, progress to a discrimination task and then an identification task by asking the child to point to the correct picture. The goal is to have the child naturally repeat the Ling Sound.
12. Keep track of the child's responses so you can compare performance over time.

Sources:

Pensylvania speech-language-hearing association. (PSHA.org)
https://www.psha.org/member-center/pdfs/LingSixSound6.pdf

Advanced Bionics (advancedbionics.com)
https://www.advancedbionics.com/content/dam/advancedbionics/Documents/libraries/Tools-for-Toddlers/tools-for-parents/The-Ling-Six-Sound-Check.pdf

Annex 3

International Outcome Inventory for Hearing Aids[5]

The International Outcome Inventory for Hearing Aids (IOI-HA) is a seven-item questionnaire designed to evaluate hearing aids' effectiveness. The inventory was developed to facilitate cooperation among researchers and program evaluators in diverse settings. It is brief and general enough to be part of other outcome measures that might be planned in a particular application and will provide directly comparable data across different projects.[6] It has been translated and validated in several languages which facilitates the use of it in different regions and countries.[7]

The IOI-HA is composed of seven questions with close answers:

1. Think about how much you used your present hearing aid(s) over the past two weeks. On an average day, how many hours did you use the hearing aid(s)?
   a. None
   b. Less than 1 hours a day
   c. 1 to 4 hours a day
   d. 4 to 8 hours a day
   e. More than 8 hours a day.

2. Think about the situation where you most wanted to hear better, before you got your present hearing aid(s). Over the past two weeks, how much has the hearing aid helped in that situation?
   a. Helped not at all
   b. Helped slightly
   c. Helped moderately
   d. Helped quite a lot
   e. Helped very much.

[5] Cox RM, Alexander GC. The International Outcome Inventory for Hearing Aids (IOI-HA): psychometric properties of the English version. Int J Audiol. 2002 Jan;41(1):30–5. doi: 10.3109/14992020209101309. PMID: 12467367.

[6] Thunberg Jespersen C, Bille M, Legarth JV. Psychometric properties of a revised Danish translation of the international outcome inventory for hearing aids (IOI-HA). Int J Audiol. 2014 May;53(5):302–8.

[7] Cox RM, Stephens D, Kramer SE. Translations of the International Outcome Inventory for Hearing Aids (IOI-HA) Intl J Audiol. 2002; 41:3–26.

3. Think again about the situation where you most wanted to hear better. When you use your present hearing aid(s), how much difficulty do you STILL have in that situation?
   a. Very much difficulty
   b. Quite a lot of difficulty
   c. Moderate difficulty
   d. Slight difficulty
   e. No difficulty.
4. Considering everything, do you think your present hearing aid(s) is worth the trouble?
   a. Not at all worth it
   b. Slightly worth it
   c. Moderately worth it
   d. Quite a lot worth it
   e. Very much worth it.
5. Over the past two weeks, using your present hearing aid(s), how much have your hearing difficulties affected the things you can do?
   a. Affected very much
   b. Affected quite a lot
   c. Affected moderately
   d. Affected slightly
   e. Affected not at all.
6. Over the past two weeks, using your present hearing aid(s), how much do you think other people were bothered by your hearing difficulties?
   a. Bothered very much
   b. Bothered quite a lot
   c. Bothered moderately
   d. Bothered slightly
   e. Bothered not at all.

7. Considering everything, how much has your present hearing aid(s) changed your enjoyment of life?
   a. Worse
   b. No change
   c. Slightly better
   d. Quite a lot better
   e. Very much better.

Note: for the purposes of the hearing aids service delivery programmes described in this document, only Questions 1 and 2 will be asked. The definition of lack of benefit as assessed by the IOI-HA for this context is a daily use below 4 hours and/or perceived benefit “not at all” or “slightly”.

Annex 4
First appointment and follow-up forms

Screening form: Ear health

1. Information about the person

First name:	**Family name:**	**Gender:** Male O Female O Other O
Age: 0-5 6-18 19-44 55-64 65+		**Telephone:**
Address:		

2. Ear and hearing health risk check

Check:	
Do you use spoken language as your usual way to communicate?	If Yes O → Continue If No O ➦ Refer to ear and hearing care professional

Ask the following questions

	Yes	No	
Have you had sudden changes in hearing (last 3 months)?			If Yes to any ➦ Refer to ear and hearing care professional
Do you repeatedly have discharge or fluid that comes out of your ears?			If No to all → Continue to next step

3. Ear screen

Look closely at each ear:

Do both ears look normal (check the shape, size and the presence of ear canal)?	Yes O No ➦ Refer to local ear and hearing care professional

Look closely inside each ear with otoscope

	Right	Left	
Ear blocked with ear wax			If any boxes are ticked → remove ear wax or foreign body If treatment successful, continue screen. If treatment not possible or not successful ➦ Refer a trained health worker or an ear and hearing care professional
Foreign object in the ear			

	Right	Left	
Ear discharge (Blood, pus, fluid)			If any discharge, dry mop ear before otoscopy
Hole in eardrum			➦ Refer ear and hearing care professional
Normal / No findings			If right and left ears are normal, continue with the assessment

4. Hearing Test

Carry out Air Conduction hearing test					
	500 Hz	**1000 Hz**	**2000 Hz**	**4000 Hz**	**Average**
Right					
Left					
How to get average: Add value for 500Hz, 1000Hz, 2000Hz, and 4000Hz then divide by 4.					
Person can't follow instructions/tested		Yes O ➦ Refer to hearing care specialist for further testing			
Test confidence:	Good	Poor O ➦ Refer to hearing care specialist for further testing			

WHO Grade of Hearing		
	Average	**Recommendation**
Normal hearing threshold level	Average of <25 dB	No action required
Mild hearing loss	Average of 26–40 dB	Monitor hearing threshold after 1 year. Teach ear health care and tips on how to improve understanding words
Moderate hearing loss	Average of 41–50 dB	→ Hearing aids Fitting
Moderately severe hearing loss	Average of 50–70 dB	→ Hearing aids Fitting
Severe hearing loss	Average of 71–90 dB	→ Hearing aids Fitting
Profound hearing loss	Average of >90 dB	➦ Refer to hearing care specialist

5. Discuss and agree actions with the person

Refer to:	Doctor	O	Teach:	Ear health care	O
	Local hearing care specialist	O	Assess for:	Hearing aids	O
	Other: ✎ _____		Follow up:	After ear health treatment	O
				1 year	O

6. Discuss and agree actions with the person.

Hearing aid fitting	Hearing aid fitted in Right ear O left ear O both ears O refused O	
If fitted, add hearing aid details	Model and number	
Counselling	Counselling regarding hearing aid use done O Flyer for care of hearing aids provided O	
Follow up:	After treatment	Follow up date:

Note: ➦ means to refer; ✎ means write notes here

General questionnaire for adults and children: Follow-up

Overview:

This questionnaire is designed to be asked by one of the workers of the program. The preferred way for follow-up should be remote. If that is not possible the questions can be done in person. If problems not able to be solved are detected remotely and/or the benefit is not according to the spectated, an in-person appointment will be scheduled.

1. Do you (your child) feel comfortable with:

	Yes	No	Don't know	
a. Put the hearing aid in the ear?				* If the answer is No in one or more questions and the problem is not able to solve remotely, kindly ask the user or parent/care giver for an in-person appointment.
b. Put in and/or take out the batteries?				
c. The fitting of the mould?				
d. The quality/level of sound?				

2. IOI-HA Q1: Think about how much you (your child) used your present hearing aid(s) over the past two weeks. On an average day, how many hours did you use the hearing aid(s)?

a. None	O	b. Less than 1 hour a day	O	c. 1 to 4 hours a day	O	*If the answer is a, b or c, kindly ask the user for an in-person appointment.
d. 4 to 8 hours a day	O	e. More than 8 hours a day	O			

3. IOI-HA Q2: Think about the situation where you most wanted to hear better, before you got your present hearing aid(s). Over the past two weeks, how much has the hearing aid helped in that situation? ***(Only for adults)***		
a. Helped not at all.	O	*If the answer is a or b, kindly ask the user for an in-person appointment.
b. Helped slightly.	O	
c. Helped moderately.	O	
d. Helped quite a lot.	O	
e. Helped very much.	O	

4. How many Ling sounds is your child able to recognize? ***(Only for children from the 2-months follow-up)***				
a. 1	O	b. 2	O	*If the answer is a, b, c or d, kindly ask the parent/care giver for an in-person appointment.
c. 3	O	d. 4	O	
e. 5	O	f. 6	O	

Annex 5
Examination of the ear[8]

1. Examination of the ear

Examination of the ear includes looking externally and at the ear canal and the ear drum.

You will need an **otoscope.** An otoscope shines a light into the ear canal and has magnification to enlarge the image. There are many kinds of otoscopes. Some otoscopes can connect to a computer or mobile phone and record pictures or videos of what is being viewed. You will also need **speculum of varied sizes**. An otoscope needs a speculum. This is an attachment to the otoscope for looking into the ear canal and is usually made of plastic. Make sure that you use a clean speculum for each patient.

Procedure:

1. First wash your hands.
2. Ask the patient if you can examine their ears, and if they have any pain.
3. Make sure the patient is seated and that you are at the same height as the patient.
4. Examine the pinna and the area around the pinna. Make sure you also examine behind the pinna to look for any swelling, redness, or pain. Look for scars from ear operations. The most common areas for these scars are behind the pinna or just in front of it.
5. Before starting the otoscopy, push the tragus and observe if the patient has any pain. Be watchful for any wincing or indication of pain when you touch the ear or insert the otoscope. Also, look for any evident discharge. If there is discharge, this will need to be mopped up before otoscopy (see description below).
6. Make sure the otoscope light is working. (If it is not, the battery may need to be replaced or recharged, or the bulb replaced.)

[8] Source: Primary ear and hearing care: training manual. Geneva: World Health Organization; 2023. See: https://www.who.int/publications/i/item/9789240069152.

7. Place the speculum onto the otoscope. If you have varied sizes of speculum, the largest one that fits into the patient's ear canal should be used. Clean the speculum with cotton wool and disinfectant before starting the examination.
8. Hold the otoscope in your right hand if you are examining the patient's right ear, and your left hand if you are examining the patient's left ear. Hold the otoscope as you would hold a pen.
9. The ear canal has a natural curve and is not straight. It points upwards and forwards, towards the eye. Using the hand that is not holding the otoscope, pull the pinna upwards and backwards to straighten the ear canal. In a young child pull the pinna straight back (not upwards). Keep the pinna held during otoscopy.
10. Insert the otoscope and speculum gently, directing it upwards and forwards (towards the eye) so that you can see the ear drum. Do not insert the speculum too deeply into the ear canal; ideally you should not need to insert more than half the length of the speculum. Putting one finger on the patient's cheek bone can help to keep the otoscope steady. Touching the skin of the deep ear canal (the skin with no hairs) may hurt the patient. If the patient experiences pain, stop. Pain can be caused by not directing the speculum correctly or by inserting it too deeply. It can also be caused by infection of the outer ear.
11. Examine the ear canal for discharge, swelling, wax, foreign bodies, or other problems.
12. Look at the ear drum. If you cannot see the ear drum it may be because there is wax or pus blocking the view of it, or because the otoscope is not positioned correctly. Gently adjust the position of the otoscope, making sure that it is directed forwards and upwards (towards the eye).
13. If there is a lot of wax or pus, you may need to perform an ear washout or dry mopping (see description below).
14. When you can see the ear drum, identify the structures. Is the ear drum normal? Is it red? Is there a hole in it (a perforation)? Is it pulled in? Is there cholesteatoma?
15. Use the findings of your examination, and the patient's history, for your diagnosis.
16. Clean the speculum with cotton wool and disinfectant after completing the examination.

Note:

- It is possible sometimes to accidentally damage the skin of the ear canal during otoscopy. If this occurs, it will be painful for the patient and may cause bleeding at the time. In most cases, such an injury will heal by itself.
- Sometimes you may not be sure what you are looking at or you may be unable to examine. In such a case, especially if the person is complaining of an ear or hearing problem, you should refer to a doctor (if required, the doctor may refer the person to a specialist).

2. Dry mopping

Dry mopping is used to clear pus out of the ear canal. It can also be used to dry the ear after washout (see description below). Dry mopping can be performed using either a **tissue wick** or a **cotton mop**. Using a tissue wick is easier and less likely to injure the ear canal. This is the preferred method. If tissue paper is not available, the cotton mop can be used.

Note: do not mop the canal when there is acute pain in the ear. If dry mopping causes fresh bleeding or severe pain, stop the procedure.

a. Using a tissue wick

The equipment needed for dry mopping using a tissue wick is **tissues**, an **otoscope**, and a **speculum**.

Procedure:

1. Wash your hands.
2. Ask permission of the patient.
3. Examine the ear (see description above) to diagnose the underlying ear problem.
4. Twist the end of a tissue to make a “tissue wick”.
5. Pull the pinna back. Insert the tissue wick 2–3 centimeters (about 1.18 inches) into the ear canal.
6. Leave the tissue wick in place for around 10 seconds.
7. Pull out the wick and see if it has pus or other fluid on it.

8. Throw away the wick you have just used.
9. Repeat with another tissue wick. Continue repeating until the tissue wick is no longer wet when withdrawn.
10. Repeat otoscopy to confirm that all pus or other fluid has been removed.

b. Cotton mopping

The equipment needed for cotton mopping is **cotton wool**, a **wooden stick applicator**, an **otoscope**, and a **speculum**.

Procedure:

1. Wash your hands.
2. Ask permission of the patient.
3. Examine the ear (see description above) to diagnose the underlying ear problem.
4. Pull off a small piece of cotton wool.
5. Gently pull it out into an oval shape.
6. Put the tip of the stick into the centre of the cotton wool.
7. Twist the stick round and round with one hand while holding half of the cotton wool tightly against the stick with the thumb and index finger of your other hand.
8. Half of the cotton wool should extend from the end of the stick and form a fluffy, soft tip.
9. The rolled-up piece of cotton wool should be sufficiently long so that when the soft tip is inserted into the ear canal there is still a portion sticking out of the ear canal. (You will then have a piece to hold on to and can ensure that all the cotton wool is removed completely from the ear canal.)
10. Pull the pinna back. Insert the mop gently into the ear canal, without pushing or forcing.
11. Pull out the mop and notice if there is pus or other fluid on it.
12. If required, repeat with another mop. Continue repeating until the mop is no longer wet when withdrawn.
13. Repeat otoscopy to confirm that all pus or fluid has been removed

Note: If dry mopping causes fresh bleeding, or severe pain, the procedure should be stopped. Wait for the bleeding to stop and then examine the ear with an otoscope to check for any injury. If there is an injury, treat it by keeping the ear dry and with the use of antibiotics, if needed. If required, refer to a specialist.

3. Washout of the ear

Washout of the ear can be used to clear wax or a foreign body from the ear canal. It can also clear pus from the ear. You will need **clean water** boiled and cooled to body temperature (37 °C), **20 ml syringe** (without needle), **kidney dish** or other bowl and **tissues**.

Procedure:

1. Wash your hands and ask permission.
2. First examine the ear (see description above).
3. Make the irrigation solution. Water should be slightly warmed to make sure it is neither too cold nor too warm. The ideal temperature is 37 °C (i.e. the same as body temperature).
4. Fill the syringe with water. If using iodine, draw up 1 ml of povidone-iodine with 19 ml of water.
5. Place the tip of the syringe into the ear canal. Point the syringe so that it is facing towards the top of the ear canal, and slightly backwards.
6. Ask the patient to hold the kidney dish or other bowl under the ear and tight against the skin of the neck.
7. Push the irrigation solution into the ear canal. The solution will drain into the bowl, and may contain wax, a foreign body or pus.
8. Repeat washout until there is only clear solution coming out of the ear, and no wax or pus.
9. Examine the ear again with an otoscope. Repeat washout if needed.
10. Use dry mopping (see description above) to dry the ear canal.

Note: Avoid ear washout if the patient complains of ear pain, has had recent surgery in the ear, has a dry hole in the ear drum or has been diagnosed with acute otitis. If the patient has pain during ear washout, stop the procedure. Use a fresh syringe and solution for each patient and remember that after an ear washout, the ear must be dried properly.

Annex 6
Infrastructure and equipment

This section presents a list and brief description of the physical resources necessary to implement the hearing aid fitting service delivery programme described in this document. Kindly take into consideration that this must be adapted to the conditions and resources of the place where the programme is carried out.

1. **Infrastructure**

The programme is designed to be implemented in a facility within the community. It could be within an existing health facility such as a primary health centre or outside of it. Depending upon the number of programme workers and the expected number of people to be served, the programme can be run out of a small space with the following characteristics:

a. Next to the community that will be served by the programme.
b. Quiet, to be able to perform hearing tests and well-lit for proper ear examination.
c. Desk and chairs for the programme workers and the users.
d. Storage for the materials.

2. **Equipment required**

a. **Otoscope**: An otoscope shines a light into the ear canal and has magnification to enlarge the image. There are many kinds of otoscopes. Some otoscopes can connect to a computer or mobile phone and record pictures or videos of what is being viewed. Some of them use batteries, others are electric or rechargeable even with solar energy. Each team should choose the one that meets the needs and resources available best.

b. **Speculums**: An otoscope needs a speculum. This is an attachment to the otoscope for looking into the ear canal and is usually made of plastic. There are varied sizes, and it is necessary to clean it up after one use. The recommendation is to have at least 2 sizes and enough of them to cover the needs.

c. **Ear mop**. The equipment needed is as follows (for more details refer to Annex 5):
   - Tissue or wool cotton
   - Wooden stick applicator (for wool cotton)

d. **Ear washout.** The equipment needed is as follows (for more details refer to Annex 5):
   - Clean water (boiled and cooled to body temperature 37 °C)
   - 20 ml syringe (without needle)
   - Kidney dish or other bowl
   - Tissues.

e. **Audiometer**: Hearing assessment can be conducted in children aged older than five years and adults using a pure tone audiometry test. In this test, sounds of different pitches are presented into each ear and the child or person is asked to respond when they can hear these. The result of an audiometry test is called an audiogram. For this programme the suggestion is to perform an air conduction audiometry covering at a minimum 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. The equipment used for performing this test is an **audiometer**. It usually consists of an embedded hardware unit connected to a pair of headphones and a test-subject feedback button, sometimes controlled by a standard computer. As an alternative to a conventional audiometer, to perform the audiometry test a programme could also use a validated App or software on a mobile phone, tablet, or computer. Such devices or apps using automated protocols that allow minimally trained persons to facilitate the pure tone audiometry could be useful. The decision of what to choose should be made for each team according to the available resources.

f. **Tympanometer (optional)**: Tympanometry helps evaluate the functioning of the middle ear. The test seeks to establish the condition and movement of the tympanic membrane as it responds to changes in pressure. It is a good test for diagnosis of otitis media. The equipment needed is a **tympanometer**. There are several diverse types; some can only do a few tests such as tympanometry and acoustic reflex measurements. More advanced tympanometers can provide a more thorough assessment of the middle ear. This test is suggested especially in children, considering that otitis media is more frequent at that age but is not mandatory.

g. **Chart for Ling test** (for more details on the Ling test, see Annex 2).

3. **Maintenance of records:** each local team should decide the way to maintain records, according to the resources available. If there is access to a computer or another electronic device, an electronic, database is suggested for this task. If that is not available this could be done on paper and should be properly archived and saved in a secure place.

Annex 7
Management of conflict of interest

All members of the technical working group (TWG) and peer reviewers completed and submitted a WHO Declaration of Interests form and signed confidentiality undertakings prior to attending any TWG meetings and review.

The WHO department for Noncommunicable diseases reviewed and assessed the submitted declarations of interest and performed an internet search to identify any obvious public controversies or interests that may lead to compromising situations.

If additional guidance on management of any declaration or conflicts of interest had been required, the department would have consulted with colleagues in the Office of Compliance, Risk Management and Ethics.

If deemed necessary, individuals found to have conflicts of interest, financial or non-financial, would have been excluded from participation in any topics where interests were conflicting.

The management of conflicts of interest was reviewed throughout the process. TWG members were required to update their Declaration of Interest, if necessary, before each meeting.

No conflict of interest was identified.

World Health Organization

World Health Organization
Department of Noncommunicable Diseases
20 Avenue Appia
1211 Geneva 27
Switzerland

For more details refer to:
https://www.who.int/health-topics/hearing-loss

9789240087927