

# COMMUNITY EAR AND HEARING HEALTH

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## PROJECTS IN THE PHILIPPINES

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My passion for raising awareness about disabilities in developing countries began before I had even started my Masters in Audiology in Sydney, Australia. Following my undergraduate degree, I spent a year travelling mostly in the countries of Africa. It was from these travels that my passion was 'set in stone' (confirmed). I was determined to return to Australia, complete my Master's degree and do whatever I could to help the hearing impaired population in the less fortunate countries of the world. Through my Master's research, I was lucky enough to undertake a thesis based in the Philippines, under the guidance of the wonderful Professor Philip Newall. The research was to take up all of my spare time and only serve to fuel my passion further.

Since then, I have been able to return to the Philippines on a yearly basis, including 2009, when I was asked to supervise two new Masters of Audiology students on their research trip to evaluate the current Low Cost Hearing Aid Project in the Philippines.

### Hearing Health Awareness in the Philippines

To explain where the projects are, currently, in the Philippines, I will give a little history of hearing health awareness in the country.

The Philippines is one of the fastest growing South-East Asian countries, with a population of 88.57 million in 2007 and, in 2010, an estimated population of 94.01 million.<sup>1</sup> In the year 2000, hearing impairment was rated as the seventh highest disability, with an estimated 28% of the population having a hearing



*The Philippines*

impairment.<sup>2</sup> That said, when it comes to hearing health care professionals, there is only an approximate one Audiologist for every 3 million people in the country.<sup>3</sup>

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**Issue No.11**

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# Projects in the Philippines

## Better Hearing Philippines Inc. (BHPI) and Easy Access to Rehabilitation Services (EARS)

Better Hearing Philippines Inc. (BHPI) is a non-government organisation that developed a National Ear and Hearing Health Care programme aiming to improve the quality of life for people with hearing impairment in their country. In May 2004, BHPI implemented the Easy Access to Rehabilitation Services (EARS) programme which is based on a Community-Based Rehabilitation (CBR) approach, as recommended by the World Health Organization (WHO),<sup>4</sup> comprising three main components:

1. Capability building.
2. Service delivery.
3. Social mobilization (Figure 1).

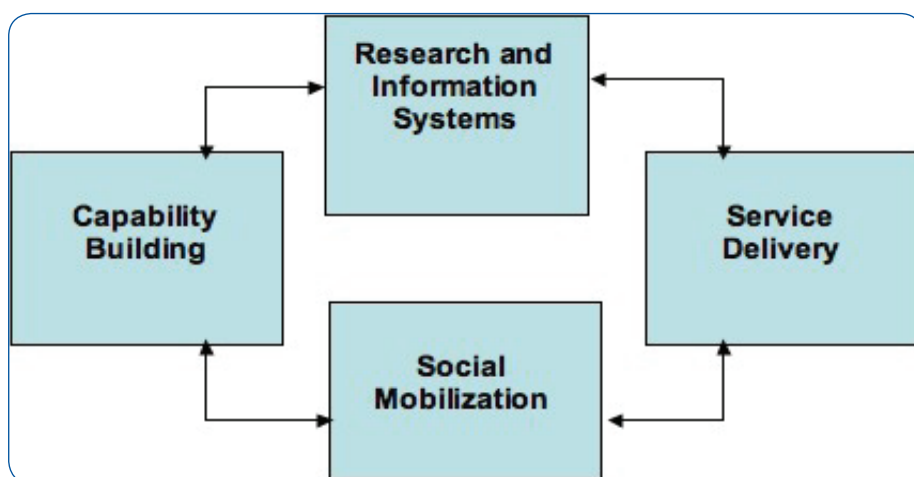


Fig 1: Components of the EARS Training Programme

Together, these aim to establish the ear and hearing programmes into primary health care services that already exist and function within each municipality. The primary focus of the EARS programme is to train the local community health care workers (Barangay Health Workers – BHWs) in the field of Audiology, to bring provision of such services to regions where there are none. The training programme workshops consist of many topics that are taught via powerpoint lectures, hands-on training and illustrations (Figure 2). The training programmes have been planned around the original training manuals distributed by the WHO. The programme gives the knowledge and power to the BHWs to be the providers of hearing health care within their own communities, and its success depends on an efficient and meaningful transfer of information between the trainers and the BHWs.

In the Philippines, in many of the remote rural areas, training has been delivered over the course of a few days, with limited follow-up after the initial training. The initial evaluation, in 2007, determined that the main limitations to the training arose due to limited follow-up training and monitoring. Current studies of primary hearing health care programmes in developing countries are placing emphasis on the importance of follow-up training to keep standards of service at satisfactory levels.<sup>5</sup> The EARS training programme has recognised this and designed it so that the majority of the topics are practical (67%) rather than theoretical (33%), as Figure 3 illustrates. This gives more hands-on training and experience and has begun to include follow-up monitoring.

BHPI has been successful in the implementation of their EARS programme. At the primary level, the BHWs are trained to provide basic hearing health care to their local communities and are responsible for raising awareness about the effects of hearing impairment and

ways to prevent unnecessary occurrence. The EARS programme has been evaluated as being able to use trained and educated Audiologists successfully. BHWs are trained to use simple equipment and simple treatment methods that are available and affordable to rural communities, where resources are scarce. Furthermore, the BHWs are now able to identify ear disease and keep patient records at a satisfactory standard, and are very competent in the basic maintenance of hearing aids.

## Low-Cost Hearing Aid Pilot Study

More recent evaluations in the Philippines have focused on a Low-Cost Hearing Aid Pilot Study based on the WHO Guideline for Hearing Aids and Services for Developing Countries,<sup>6</sup> in conjunction with World-Wide Hearing (WWHearing). This Low-Cost Hearing Aid Project commenced in 2009 and is aiming to fulfill the mission of WWHearing, by promoting 'better hearing through the provision of hearing aids and services in developing countries and underserved communities'.<sup>7</sup> Hearing aid fitting is being done by Nurses and Midwives through secondary training (in line with the WHO guidelines), and the cost of the hearing aid is based on the individual's income and social status after an evaluation process. They are required to visit the nearest municipality clinic three times, for screening, for fitting and for follow-up. Unfortunately, however, evaluation has shown that one of the main barriers the patients are facing is the cost of transportation to the municipality centre. Future efforts may be made to overcome this barrier by travelling to the local communities to provide the service. Some municipalities have elected to use their allocated

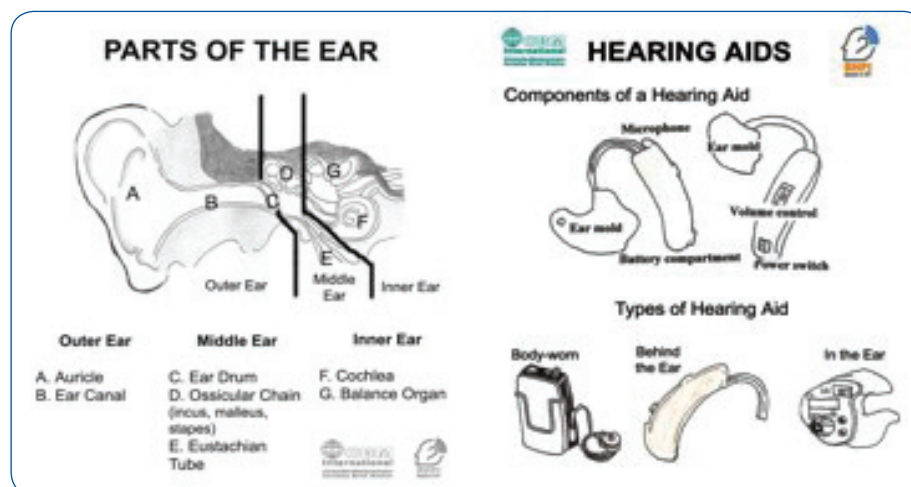


Fig 2: Illustrative Posters used in the EARS Training Programme (courtesy of BHPI)

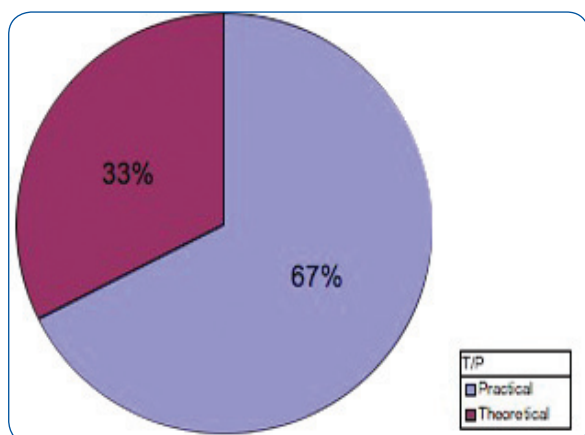


Fig 3: Comparison of the amount of 'Practical Topics' versus 'Theoretical Topics'

disability funding to cover the transport costs for the patients. This is directly in line with a principle of the CBR approach which focuses on the importance of the involvement and commitment of the community involved, to ensure that a programme is sustainable within that community.<sup>4</sup> The most recent evaluation of the Philippines Low-Cost Hearing Aid Project has shown that there is little difference in patient satisfaction if they were fitted by an Audiologist or by a secondary-trained Nurse or Midwife. Outcomes were comparatively similar in both situations. As such, future efforts should be focused on increasing community awareness and involvement in the project.

### Challenges

The main challenges facing hearing loss prevention programmes are the size of the problem, the lack of trained hearing health care workers and a general lack of awareness about the implication of hearing loss, not just to an individual, but to their families, communities and countries. I personally think it is wonderful to read about and see the wonderful steps forward that developing countries are taking in regard to hearing health and I feel grateful to have been involved in a very small part of the journey so far.

### Acknowledgement

My personal thanks to Professor Philip Newall for all his guidance and inspiration.

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## SOUND HEARING 2030: SOME EXPERIENCES IN INDIA

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India is a country of large numbers. The second most populous country in the world (over 1100 million), India has a large population of hearing impaired. With an estimated prevalence of 6%, there are over 65 million persons suffering with disabling hearing loss.\* As per estimates, approximately 25,000 deaf children are added to the country's population every year. These figures indicate the need of a formal and systematic method to prevent the onset of hearing loss. Wherever it does occur, the adverse effects of this impairment can be controlled, to a great extent, provided suitable and timely action is taken. Recognising these facts and based on the principles of Sound Hearing, the Government of India decided to initiate a pilot project for Prevention and Control of Hearing Loss in the country. This project was started in 2006 and is based on the concept of the 'Healthy Ear District'. In the initial phase, the



project was started in 25 districts over 11 states across the country. In 2008, this project has taken the shape of a full National Programme and is to be gradually expanded to include 200 districts by the year 2012. The Programme has also been integrated with the National Rural Health Mission under the Ministry of Health and Family Welfare, Government of India.

\*Disabling hearing loss is a hearing threshold greater than 40dB in the better hearing ear, in adults, or greater than 30 dB in the better hearing ear in children.



# Sound Hearing 2030 in India

## The District Hospital and the Community

The Programme is a community-oriented one and the **District Hospital** is the nodal point for the actual implementation of the Programme. As the District Hospital is the first point of contact between the community and a trained ENT Doctor and Audiologist, it is the main focus of the Programme. Both of them undergo a skilled based re-orientation programme at the State Medical College. The programme for the ENT Doctors is over 5 days and that for Audiologists is for 3 days. The District Hospitals have been strengthened with the provision of equipment to enable diagnostic, as well as therapeutic and rehabilitative procedures, to be carried out. An Audiological Assistant and a Teacher for Young Hearing Impaired have been posted at the District Hospital under the Programme.

## The Primary Health Centre

The **Primary Health Centre (PHC)** is the first level in the organised health care delivery system, where a qualified medical Doctor is available to the community. The Doctors here are being trained (through a 2-day training programme) to re-orientate them to ear problems and ear examination. They are also provided with the basic diagnostic equipment, to enable them to diagnose, treat and refer the patients with hearing and ear diseases. Obstetricians and Paediatricians in the districts covered have also undergone a one day sensitisation to enable them to detect deafness in neonates and young children.

## Community and Public Health Workers

**Multi-Purpose Workers and Public Health Nurses** form the link between the community and the formal health care delivery system. They are now sensitised to the Programme and to their specific roles in the Programme for promoting community ear and hearing health. They have undergone one day training to enable them to carry out their designated tasks.

## School Health

The **School Health System** plays a very important role in the Programme. The **School Teachers of the Primary Section** conduct a survey based on a questionnaire for the Primary children. Those found to be positive, undergo an ear check-up by the School Health Doctors or the PHC Doctors, who have received one day of training in this aspect of care. The School Health Doctors identify, treat and refer the children with ear and hearing disorders.

## Medical Colleges

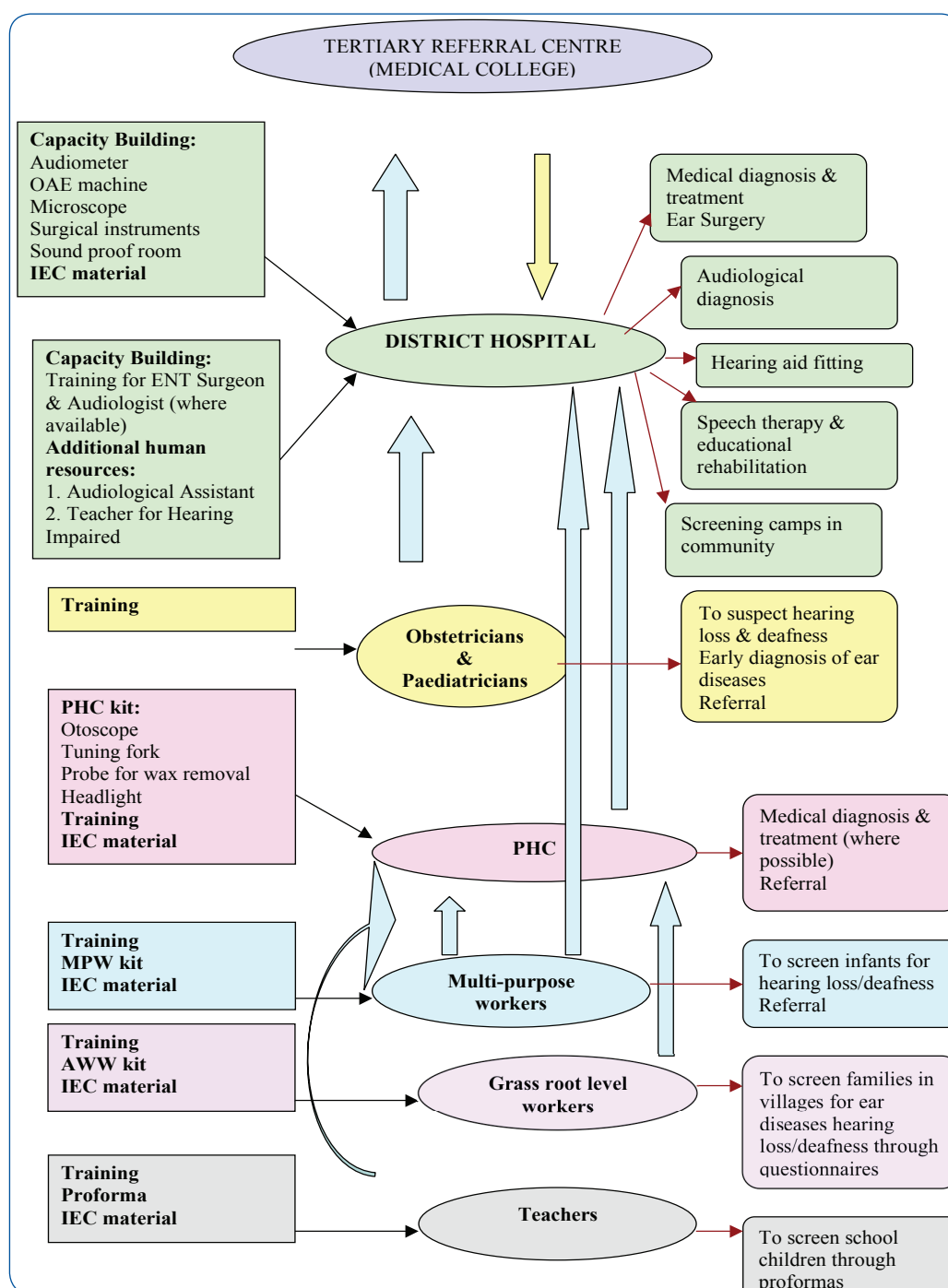
The **State Medical Colleges** are the Centres of Excellence which support the programme in the State, with provi-

sion of expertise for training, as well as patient care and referral.

## Provision of Services

The most important aspect of the programme is **Service Provision**. This includes **screening of persons for ear and hearing diseases** through:

- **Community based camps:** These are held in different parts of the District every month. This helps to identify persons with ear diseases as well as hearing loss. Suitable therapy can be started at the camp, when possible, or the patient referred to the District Hospital for investigations and treatment.



## • **Diagnosis and medical treatment:**

Patients are able to seek treatment at the PHC as well as the District Hospital. At the PHC, the primary level Physician examines the ear of the patient with the equipment provided under the Programme. They can provide or start treatment when possible. Those patients who cannot be treated at the PHC, or who require investigation or special treatment are referred to the District Hospital.

• **Surgical treatment:** The District Hospitals are being equipped to provide all possible surgical options that are commonly required by a patient suffering with ear disease.

• **Audiological diagnosis:** Most audiological diagnoses can now be carried out at the District Hospital with the help of the equipment provided (pure tone audiometer, impedance audiometer, OAE

analyzer), which is done by the Audiologist as well as the Audiological Assistant at this Centre. Referral to the tertiary centre will be required only for the purpose of special investigations such as the ABR (auditory brainstem response).

• **Hearing aid fitting:** Children under the age of 14 years who are identified under the Programme and adjudged by the ENT Surgeon and Audiologist/Audiological Assistant to be in need of a hearing aid will be fitted with a hearing aid, free of cost at the District Hospital. The hearing aid will be fitted with a custom made mold and main-

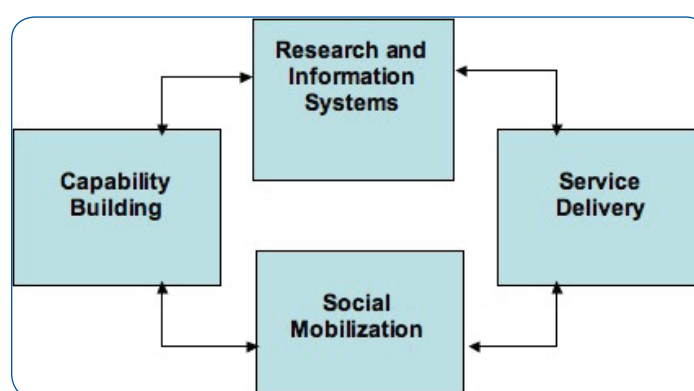


Fig 1: Components of the EARS Training Programme

tained (other than batteries) free of cost by the hearing aid supplier under the Programme. The same benefit can also be extended to other beneficiaries (above 14 years) under the Programme at the discounted cost, as per the Government rate contract.

• **Hearing and speech therapy; rehabilitation:** These are provided to those needing care at the District Hospital. The District Audiologist/Audiological Assistant provide these services. This is to be accompanied by educational rehabilitation by a special teacher at the District Hospital.

## Information, Education and Communication (IEC activities)

Creation of awareness is an integral and vital part of the Programme. Posters, handouts, leaflets, flip charts as well as radio and television clips, which have been prepared, are broadcast for this purpose. The main themes that they address are:

- **Early identification of the deaf child**
- **Prevention and treatment of otitis media**
- **Noise pollution**
- **Ear care and hygiene.**

Besides the above nation-wide Programme, efforts are also being made to incorporate other concepts of Sound Hearing at the national and sub-national level. These include 'School Ear and Hearing Check' and 'Less Noisy Cities'. The School Ear and Hearing Check is underway in the schools of Delhi in collaboration with local NGOs. The proposal for Less Noisy Cities has been set up in the city of Delhi and the Government has initiated preliminary studies in this regard.



Photo: National Programme for Prevention & Control of Deafness



Photo: National Programme for Prevention & Control of Deafness



## TUNING FORK TESTS: A BASIC PRIMARY HEARING ASSESSMENT APPROACH TO IMPROVING CLINICAL EFFICIENCY

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is substantially more efficient, and this advantage is lost if there is any occlusion or breakage in the conductive pathway.<sup>1,2</sup> Also, by the seventeenth century, it had been shown that the perception of the direction from which a sound is coming is governed by the fact that one ear is hit by the sound more intensely than the other ear. In 1827, a German physician named C.T. Tourtual and C. Wheatstone, a physicist in London, demonstrated that

otologist, in 1845 and by A. Rinne, a German physician in 1855. Although the diagnostic value of tuning fork tests was initially poorly acknowledged, it gradually became more popular in clinical practice from the early twentieth century.<sup>2</sup> Its use has, however, diminished in most regions with the advent of audiometers and other electrical hearing test gadgets.

### Indications and Use of Tuning Fork Tests

Tuning fork tests are indicated for screening of hearing loss as part of a routine clinical examination, evaluating the type of hearing loss and determining the need for referral. Use of the 512Hz and 1024Hz forks for this test is recommended. However, they should be performed, preferably, in a quiet room to minimise the effects of noise. They offer quick test methodologies which are non-invasive, easy to administer and interpret, without the need for special instrumentation. Hence, they can provide rapid clinical information on the possible diagnosis, especially where audiometers are unavailable. Additionally, they can be used to complement modern audiometric practice, such as in demonstrating aided sound field (using 4096 Hz tuning fork); ascertaining aided sensitivity at varying distances (especially for 2048 Hz tuning fork); determining impedance-integrity of the amplified system on a patient's ear (using 1024 Hz tuning fork) and balancing amplification in the hearing aid fitting process (preferably using the 512 Hz tuning fork).<sup>2</sup>

Their limitations in testing for hearing loss include being prone to considerable variability in technique, subjectivity in interpretation, especially in children, and accuracy due to uncontrolled sound fields. Also, they do not measure the degree of hearing loss or its effects on speech.

The most commonly used tuning fork test procedures are the Weber and Rinne tests. The Weber test is a qualitative bone conduction test that is used to assess if both ears hear equally. It is based on the principle that signal by bone lateralises to the better hearing ear or to the one with more conductive

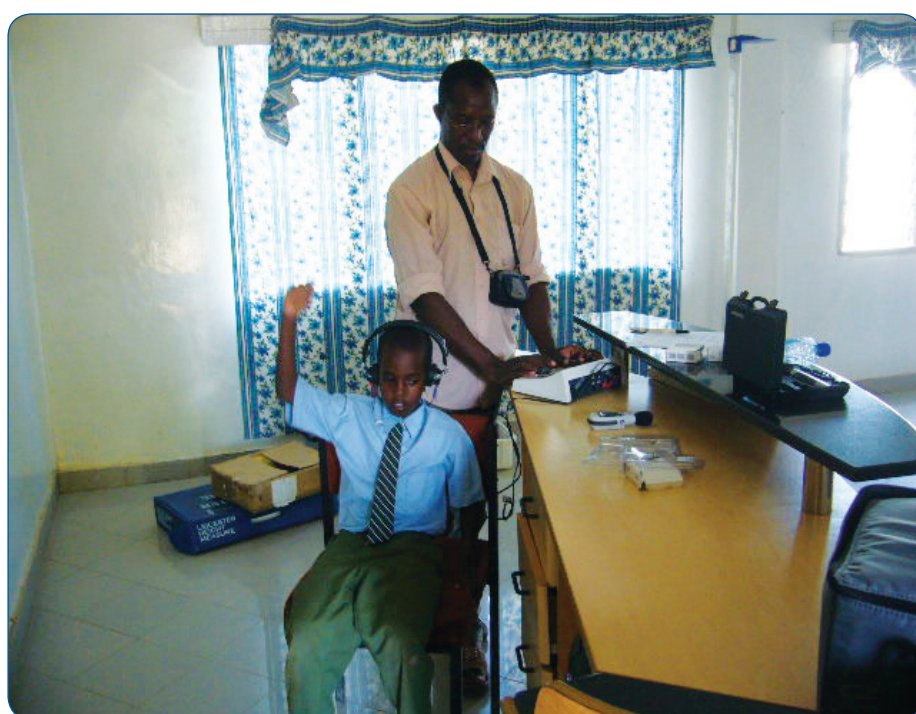


Photo: Omondi Dickens

### Introduction and Historical Background

Tuning forks are made of steel, aluminium, or magnesium alloy. When vibrated they produce sound according to the set frequency. The vibrations produced can be used to assess a person's ability to hear different sound frequencies. Tuning fork tests are non-invasive, qualitative assessment procedures conducted to determine if a person has a hearing loss. The basic principle involved in the tests is that sounds can be perceived via air conduction through the middle ear and bone conduction through the skull. This provides a means of differentiating between hearing disorders located in the middle ear and those located in the sensory-neural pathways. Typically, air conduction is physiologically more sensitive because transmission of sound by air

this phenomenon also holds true for sound conducted via the skull bones. A similar finding was demonstrated by E. H. Weber, a German anatomist and physiologist, in 1834.<sup>3</sup>

It is reported that the tuning fork was invented by John Shore in 1711. At first, tuning forks were made as small steel instruments consisting of a stem with two stout flat prongs. It was at the time more widely used in music, as a standard for tuning musical instruments, and in acoustic investigations. By the mid 19th century, it had been demonstrated that tuning forks can elicit 'vibration sense', which then was the acknowledged basic method of testing neural pathways. Soon afterwards, its clinical application into physiology and otology was described in greater detail by E. Schmalz, a German

loss. The Rinne test is a qualitative test that compares perception of sounds as transmitted by air through the middle ear (AC) to that of bone conduction (BC) through the mastoid in the same ear. It is based on the principle that transmission of sound by air is more efficient than by bone conduction. Hence, a normal finding will indicate that air conduction is better than bone conduction (AC>BC). Thus, one can quickly suspect conductive hearing loss. In cases of a unilateral hearing loss, the test can be used to discriminate which of the ears has the greater bone conduction. As a screening test, it should be used complementarily with the Weber test to confirm the nature of hearing loss.

## Validity of Tuning Fork Tests

In terms of accuracy of tuning forks to predict hearing loss, there is obvious discrepancy in research findings in the literature. Their predictive accuracy depends on the type and severity of the hearing loss; air bone gap and differences in hearing level between both the ears. The results may, however, be subject to methodological techniques, research settings and age of participants. Some studies have shown that the values of the Rinne and Weber tests were poor predictors of mild conductive hearing loss when the air-bone gap is less than 25 dB. However, the reliability improves with an air-bone gap between 25 and 40 dB.<sup>4,5,6</sup> Use of a combination of Rinne,

**Table 1: Interpreting Results**

Test	Description	Interpretation
<b>Weber</b> It tests if both ears hear equally	<ul style="list-style-type: none"> <li>Sound is heard centrally or in both ears equally;</li> <li>Sound lateralises to better hearing ear;</li> <li>Sound lateralises to poorer hearing ear;</li> </ul>	<ul style="list-style-type: none"> <li>Normal or sensori-neural hearing loss;</li> <li>Sensori-neural hearing loss;</li> <li>Conductive hearing loss</li> </ul>
<b>Rinne</b> It tests both AC and BC of the same ear	<ul style="list-style-type: none"> <li>Air conduction better than bone conduction (AC&gt;BC);</li> <li>Bone conduction better than air conduction (BC&gt;AC)</li> </ul>	<ul style="list-style-type: none"> <li>Normal or sensori-neural hearing loss;</li> <li>Conductive hearing loss</li> </ul>

Weber, and absolute bone conduction tests, based on different tuning fork frequencies, particularly 512 Hz and 1024 Hz, was found to improve accuracy and reliability of the tests. Hence, they are recommended as initial screening tools that can be used within a primary care setting to decide whether referral to a specialist or further audiometric testing is required.<sup>7</sup>

On the other hand, another study has shown that there is a poor correlation between the air-bone gap and the tuning fork test results among children with OME, and concluded that the

overall accuracy of the Rinne and Weber tuning fork tests, in predicting conductive hearing loss associated with OME in children, is poor.<sup>8</sup> In a systematic review of the tuning fork tests among the elderly, Bagai and colleagues found that the Weber and Rinne tests have low accuracy, therefore limiting their use for general screening.<sup>9</sup> However, more rigorous experiments based on standardised methodologies and conducted within a controlled environment are needed to confirm the screening value of tuning fork tests, particularly for the low resourced settings where audiometers and skilled staff are lacking.



Photo: Omondi Dickens

In a low resourced setting, such as Kenya, health care is based on a decentralised system where most peripheral health facilities are manned by community nurses who are not specially trained in audiology. Also, most health facilities lack special screening and diagnostic audiological equipment and the majority of the health workers are not familiar with their use either. Hence, tuning forks tests provide the most basic screening tool for hearing loss. From a service delivery point of view, increasing use of tuning fork tests is likely to increase requests for diagnostic assessment. Importantly, however, efforts to increase awareness must be accompanied by deliberate efforts to provide audiological equipment, training of staff at various levels and appropriate service delivery approaches. These would considerably improve population coverage, so that help-seeking is met with a supply of better-prepared, more responsive services.



# Tuning Fork Tests

## Procedure and Results

The tuning fork set available for use should ideally comprise the following frequencies:

- (a) 256Hz - A low tone tuning fork, mainly vibratory, best used to deliver bone conduction tests.
- (b) 512Hz - This is the most commonly used fork.
- (c) 1024Hz - This frequency approximates with the Speech Reception Test (SRT) score.
- (d) 2048Hz - Provides the highest test frequency with tuning forks.
- (e) 4096Hz - Has a short vibrating time, usually no more than 5 or 6 seconds.<sup>2</sup>

Construction of the fork should be thick aluminium or stainless steel, able to produce vibratory signals of at least 50-60dB SPL of sound pressure (you may use a sound level meter to ascertain this level), with the longest possible sustained tone. The patient is instructed sit and the procedure explained adequately. Sound is produced by striking one prong of the tuning fork against a thick surface area. It is imperative that the hand holding the fork that is being struck is far enough down the handle of the tuning fork, to avoid dampening its vibration potential. The aim is to achieve uniform and solid vibration. The environment required for the tests should provide for a non-reflective site with no echoes and the back sound field levels of less than 45dB A.

It is generally recommended that tuning forks with frequencies lower than 512Hz should not be used for Rinne because the tactile vibration produced may be mistaken for sound, thereby increasing the chances of eliciting false positive responses.<sup>4</sup>

## Rinne Test

In the Rinne test, the base of the vibrating tuning fork is held against the mastoid process, close to the auricle, to transmit sound through the mastoid bone into the inner ear. It is then held lateral to the tragus at a distance of about 2.5cm. Hold the prongs in-line with each other to reinforce their signal. Care should be taken not to touch the auricle with the stem of the fork since the tactile sensation by the auricle may be confused for sound by the patient. This is repeated alternately to allow time for the patient to judge the sounds. The patient is then asked to determine which sound is louder, the sound heard through the bone or through the air.

## Weber Test

A second hearing test using a tuning fork is the Weber test. For this test, the stem or handle of the vibrating tuning fork is placed on the midline of the forehead. The patient is then asked to identify which ear hears the sound created by the vibrations. Tuning forks of different sizes produce different frequencies of vibrations and can be used to establish the range of hearing for an individual patient.

## Conclusion

Despite the apparent declining value of clinical applications and questions over their accuracy, tuning forks still complement audiological tools of measurements. They offer rapid test methodologies which are non-invasive, easy to administer, interpret and do not require special instrumentation. Hence, they provide a valuable alternative hearing assessment tool, particularly where audiometers are unavailable.

In terms of service delivery, the tuning fork tests may improve clinical efficiency in a busy clinic or ward, as a rapid test which is easy to use even by a non-specialist, particularly in poorly resourced settings.

In low resourced situations, especially with a decentralised health system, where most peripheral health facilities are manned by community nurses who are not specially trained in audiology, the tuning fork tests still remain the most basic screening method for hearing loss.

High disease burdens and population coverage by services remain a critical concern in such settings. Simultaneously, there is a substantial gap between what could be achieved and what is actually being achieved in terms of health improvement in low- and middle-income countries. Therefore, simple cost-effective interventions to address common diagnostic needs are essential to augment care.

With widespread use of the tuning fork tests, it is likely that there will be increasing requests for diagnostic audiological assessment. Importantly, however, efforts to improve the demand side must be accompanied by strong health systems and service reform, so that help-seeking is met with a supply of better-prepared, more responsive services.

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## QUIZ: TUNING FORKS

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### PRIZE! TWO TUNING FORKS!

*The first two correct answers for all 5 questions sent by email to Dr Mackenzie will each receive a tuning fork!*

*Remember to send your full name and postal address.*

- Which frequency tuning fork should be used in ideal circumstances?
  - 516Hz
  - 258Hz
  - 129Hz
- The Rinne test is positive in both ears in a 12 year old boy. Is the boy's hearing definitely normal?
  - Yes
  - No
- The Rinne test is negative in both ears in a 30 year old woman. Is the woman's hearing definitely normal?
  - Yes
  - No
- The Rinne test is negative in the right ear of a 21 year old man and positive in the left ear. Would this indicate a sensori-neural hearing loss in his left ear?
  - Yes
  - No
- The Weber test lateralises to the left ear in a woman of 26 years where the Rinne test is positive in both ears. Does this indicate:
  - She has better hearing in the left ear?
  - She has better hearing in the right ear?

*\*Answers will be published in the next Issue of Community Ear and Hearing Health*

## BOOK REVIEW

### AUDITORY STEADY-STATE RESPONSE Generation, Recording and Clinical Applications

Edited by Gary Rance PhD

Plural Publishing Inc., 2008; 335 pages.

San Diego, Oxford, Brisbane

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As the preface correctly states, this book is the first dedicated entirely to Auditory Steady-State Responses (ASSRs), reflecting the prominence in research and clinical utility that this technique has gained in recent years. Although ASSRs were first described five decades ago, their visibility has dramatically risen only during the past decade. In fact, compared to their minor role in the early years, ASSRs have become such an important method in mainstream audiometric assessment and research that some assume that they are a new technique and their long history is often ignored

(even in some of the chapters of this book...).

The book includes 15 chapters written by the top authorities on ASSRs, covering all aspects of technology, stimulus-response relationships, generators, subject variables, clinical applications with specific emphasis on threshold estimation, hearing screening, fitting hearing aids and cochlear

### AUDITORY STEADY-STATE RESPONSE

GENERATION, RECORDING, AND CLINICAL APPLICATIONS



GARY RANCE



implants and illustrative case studies. In addition, the 80 Hz ASSRs are compared to other auditory evoked potentials, bone conduction ASSRs and the use of ASSRs to assess auditory ability other than pure-tone audiometry, e.g., speech and temporal processing, are described.

The chapter on technical principles of ASSRs is a thorough review of the methodology of stimulus modulation and response analysis. These aspects of ASSRs are central to their application and the chapter includes some of the best explanations in the literature on these aspects, as they relate to ASSRs. The authors did a very good job of addressing a wide variety of reader backgrounds, as might be expected from the users of ASSRs, ranging from researchers who are well-versed in signal processing to practitioners who may not be as familiar with signal processing, but need to know the determinants of the responses in order to use them properly in the clinic. The chapter covers this wide range of backgrounds by supple-

menting the essentials in the body of the text with ample footnotes and references to the literature. The end product is admirable. Also noteworthy in their comprehensive coverage of basic aspects of ASSR are the chapters on generators, stimulus and subject factors, principles of clinical application and bone conduction ASSRs.

The chapters devoted to application of ASSRs are as thorough, but are naturally more dependent on the cumulative experience with ASSRs and will, therefore, probably undergo updates in future editions. These chapters cover behavioral threshold estimation, hearing screening and hearing device (hearing aids and cochlear implants) fitting and are as thorough on their topics as the technical chapters are on theirs. The authors do not shy from pointing out shortcomings and caveats in applying ASSRs to the specific uses discussed (e.g., artifacts in cochlear implant fitting) alongside highlighting the advantages. These practical chapters are followed by a chap-

ter devoted to specific case studies that comprehensively summarize individual cases, demonstrating both the advantages and limitations of ASSRs in audiological use. The chapter includes contributions from very experienced users of ASSRs and this is reflected in the critical and mature descriptions of the cases and the contribution of ASSRs to clinical use.

In summary, this comprehensive text is a must for anyone using or intending to use ASSRs in research or clinical applications. It is a most welcome and needed addition to textbooks covering physiological measures of auditory function.

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## ABSTRACTS

### Listening and speaking ability of Thai deaf children in pre-school aural rehabilitation program

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**Background:** An auditory-oral approach can help deaf children achieve success in oral communication. Many studies confirm that deaf children with access to sound through high-powered and appropriate hearing aids at the youngest age possible have the capability to acquire communication skills similar to their hearing peers.

**Objective:** Evaluate the listening and speaking progress made by 27 Thai hear-

ing-impaired children who attended a preschool aural rehabilitation program, which was established at Audiology and Speech clinic. After hearing aids fitting, deaf children were enrolled to the preschool aural rehabilitation program after receiving their parents consent.

**Material and Method:** Hearing impaired children were divided into groups of 4-6 children with approximately the same level of performance. The listening and speaking performance at the initial period were recorded. Each group participated in the 3-hour-program once a week, included auditory training, conversation (maternal reflexive method), and speech stimulation. The improvements and problems of each child were recorded at the end of session. Listening and speaking performance evaluation were recorded at six months intervals.

**Results:** There were 12 boys and 15 girls. The average hearing loss in the better ear was 104 dBHL, range from 83-117 dBHL, SD = 8.33. The mean age of enrollment was 2 years and 10 months. The majority gradually developed listening skills and speaking ability. There was no relationship between age of enroll-

ment and the listening and speaking ability ( $p > 0.05$ ). However, listening skills had positive relationship with length of speech ( $r = 0.685$ ), number of spoken vocabulary ( $r = 0.665$ ), and speech character ( $r = 0.598$ );  $p < 0.01$ .

**Conclusion:** Auditory training is an important task to develop listening skills and improve length of speech, speaking vocabulary, and speech character. Other benefits from the aural rehabilitation program included monitoring the auditory progression after hearing aid fitting, parents meeting, and promotion a better quality of life by enabling hearing impaired children to participate in hearing society.

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## Prevalence and etiology of hearing loss in primary and middle school students in the Hubei Province of China

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Tongji Hospital  
Tongji Medical College  
Huazhong University of Science and Technology

### Wuhan, China

The purpose of this study was to investigate the prevalence and etiology of hearing loss in primary and middle school students in the Hubei province of China. During a 2-year period, 504,348 students were examined by a speech audiometry test, and 813 deaf students were detected. Among the 813 deaf students, 232 cases were diagnosed with congenital deafness and 560 cases had acquired deafness, among which 276 cases had aminoglycoside-antibiotic-induced deafness. The severity of deafness could be further ascertained in 804 other students, with 402 profound, 363 severe, 21 moder-

ate and 18 mild deafness cases. The age at deafness onset of most students was under 3 years. The prevalence of congenital and acquired deafness was 0.046% (232/504,348) and 0.111% (560/504,348), respectively, much lower than previously reported in other regions of China. Furthermore, the genetic factor was identified as one of the principal causes of deafness by pedigree analysis.

### Published courtesy of:

*Audiol Neurotol.* 2010; **15**(6): 394-398

## Epidemiological and economic burden of pneumococcal diseases in Canadian children

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Quebec, Canada

pneumococcal diseases in Canadian children. The epidemiological data and the economic cost of these diseases are crucial elements in evaluating the relevance of a vaccination program.

**Methods:** Using provincial databases, ad hoc surveys and published data, age-specific incidence rates of pneumococcal infections were estimated in a cohort of 340,000 children between six months and nine years of age. The costs of these diseases to the health system and to families were also evaluated using data from Quebec and Manitoba.

**Results:** Cumulative risks were one in 5000 for pneumococcal meningitis, one in 500 for bacteremia and one in 20 for pneumonia, leading to 16 deaths in

the cohort. About 262,000 otitis media episodes and 32,000 cases of myringotomy with ventilation tube insertion were attributable to *Streptococcus pneumoniae*. Societal costs were estimated at \$125 million, of which 32% was borne by the health system and 68% was borne by families. Invasive infections represented only 2% of total costs, while 84% were generated by otitis media.

**Conclusion:** Pneumococcal infections represent a significant burden for Canadian children and society that could be significantly reduced through immunization.

### Published courtesy of:

*Can J Infect Dis.* 2003; **14**(4): 215-220.

## Public health impact of hearing impairment and disability.

Kotby MN, Tawfik S, Aziz A, Taha H.

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This presentation of the public health impact of hearing impairment highlights the important elements of interaction between the disability and community.

**Objectives:** Retrospective study to identify the size of the problem of hearing loss, illustrating not only the magnitude

but also the serious effect of the lack of reliable data concerning this matter. It highlights the challenges met within a mid-economy community regarding the handling of the impact of the disability. The Egyptian data is given as an example of the situation in a mid-economy community.

**Study design:** A brief introduction of some epidemiological factors of hearing impairment is presented including the size of the problem in Egypt. Data of the neonatal hearing screening program of the Audiology Unit, Ain Shams University, is presented. The impact of the disability is then discussed in relation to the age of onset and the degree and type of hearing loss. This is followed by the description of the nature and effect of the disability in the different age groups. A discussion of the various factors that may modify the capa-

bility of the community to deal with such disability follows. This includes various economic indices with their possible limitations on the part of the community. Such a briefing illustrates the challenges met in the rehabilitation of the deaf and the hearing-impaired in a developing mid-economy country. The broad lines of the management of the problem both at the prophylactic as well as the rehabilitative levels are discussed. A final remark on recommendations and possible future development in a developing country is presented.

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## COMMUNITY EAR AND HEARING HEALTH

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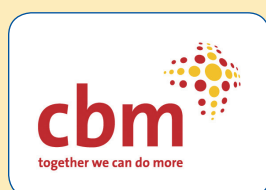
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## SOUTH ASIA CENTRE FOR DISABILITY INCLUSIVE DEVELOPMENT & VISION RESEARCH, INDIAN INSTITUTE OF PUBLIC HEALTH, HYDERABAD, ANDHRA PRADESH, INDIA (Director: G.V.S. Murthy)

### Public Health Planning for Hearing Impairment

**Date: 10TH TO 14TH OCTOBER 2011**

**BACKGROUND:** The World Health Organization estimates that there are 278 million people in the world with disabling hearing loss. Two-thirds of these people live in developing countries.

**AIM OF THIS COURSE** is to enable participants to understand the magnitude and causes of hearing impairment and the challenges of providing hearing health in developing countries. The course will familiarise participants with public health approaches to ear and hearing health and show how to develop programmes for the prevention and management at the local, district or national level.

### This 5-day course is particularly suitable if you:

- Are an Otolologist, Audiologist, or allied health professional, especially in the health sciences, or a health planner or an NGO staff member.
- Have an interest in the developing world.
- Are interested in establishing, continuing or resuming a career in ear and hearing health in the developing world.
- Have an interest in the planning principles involved in establishing public health programmes for ear and hearing health in the developing world.
- Are interested in working in partnership with developing world practitioners.

### Teaching method on this course:

- Interactive sessions
- Group-work
- Develop Planning document
- Field trip.

**Cost exclusive accommodation:** INR 10,000 or GBP 125  
**Cost inclusive accommodation:** INR 25,000 or GBP 350  
(daily lunch and tea included in all fees)

**Deadline for application:** 1st September 2011

### For more information contact:

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### PUBLIC HEALTH PLANNING FOR HEARING IMPAIRMENT

Public Health Foundation of India & London School of Hygiene and Tropical Medicine  
Collaborative Project

**10<sup>th</sup> – 14<sup>th</sup> October 2011 – Short Course**

Course Co-organisers: Professor Andrew Smith, Dr GVS Murthy and Dr Daksha Patel

## COMMUNITY EAR & HEARING HEALTH

### Aim

- To promote ear and hearing health in developing countries

### Objectives

- To facilitate continuing education for all levels of health worker, particularly in developing countries
- To provide a forum for the exchange of ideas, experience and information in order to encourage improvements in the delivery of ear and hearing health care and rehabilitation.

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