

Program

*A Sound Foundation
Through Early
Amplification*

International Pediatric Audiology Conference
November 8–10, 2010
Chicago, USA

sponsored by Phonak

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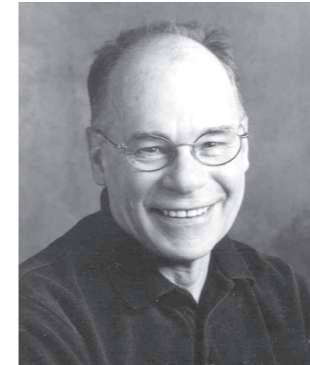
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Susan D. Scollie, Ph.D.
The University of Western Ontario
London, Ontario, Canada

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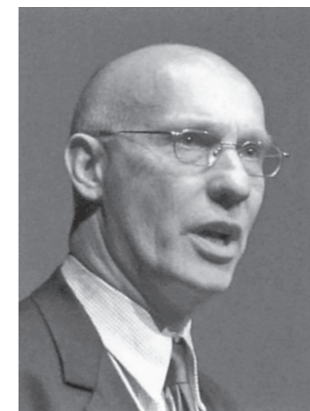
Anne Marie Tharpe, Ph.D.
Vanderbilt Bill Wilkerson Center
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Dear Conference Participant,

On behalf of the Conference Steering Committee and Phonak, we welcome you to **A Sound Foundation through Early Amplification: The Fifth International Conference**.

The first four Sound Foundations Conferences, held here in Chicago in 1998, 2001, 2004, and 2007 were highly successful with over 400 participants, representing more than 30 different nations, attending each. To date, more than twenty thousand copies of the Proceedings from these conferences have been distributed world-wide. This fifth **Sound Foundations** conference is the result of three years of planning. We would like to take this opportunity to express our sincere appreciation to the many individuals who have participated in creating this conference on infants and children with hearing loss.



First, we wish to acknowledge the many contributions of the individuals who served on the Conference Steering Committee. The quality of the conference program is a direct reflection of their extensive work over the past three years.

The seemingly endless list of details associated with organizing a conference of this scope fell to Christine Jones and her group at Phonak US. Their organizational expertise and spirit of helpfulness have brought us all together for this event.

Finally, we express our appreciation to the entire family at Phonak AG, and especially Ora Buerkli, for their support of this event. This conference reflects Phonak's commitment to professional development and their longstanding dedication to quality hearing health care for children.

This conference is about the services we provide to infants and children with hearing loss and their families. It is our sincere hope that you will find something at this conference that facilitates your work with infants, children and their families in the future. You are also encouraged to share your knowledge and experience with other participants during formal and informal discussion opportunities.

We thank you for your participation and wish you a most enjoyable and informative experience during your stay in Chicago.

A warm welcome to you all,

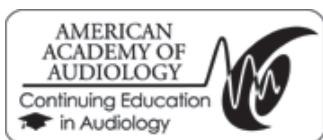
Richard Seewald

John Bamford

Co-Chairs, Conference Steering Committee



Phonak, Inc. is approved by the Continuing Education Board of the American Speech-Language-Hearing Association (ASHA) to provide continuing education activities in speech-language pathology and audiology. This program is offered for 1.1 CEUs (Advanced level; Professional area). ASHA CE Provider approval does not imply endorsement of course content, specific products, or clinical procedures.



Phonak Hearing Systems is approved by the American Academy of Audiology to offer AAA CEU's for this activity. Academy approval of this continuing education activity does not imply endorsement of course content, specific products, or clinical procedures.

Program

Monday, November 8

Conference Opening

8:30 Welcome and Introduction
Richard Seewald (Canada) and
John Bamford (United Kingdom)

Identification of Hearing Loss in Infants and Children

Session moderator: John Bamford

8:45 Session Introduction

8:50 **The Judith Gravel Lecture:**
Infant Hearing Loss in Developing Countries -
Exposing a Silent Epidemic
De Wet Swanepoel (South Africa)

9:30 Introduction of Keynote Address

9:35 **Conference Keynote Address:**
Universal Infant Hearing Screening: Successes and
Continuing Challenges
Karl White (USA)

10:15 Morning Break

Audiologic Diagnosis: Getting it Right from the Start

Session moderator: Anne Marie Tharpe

10:45 Session Introduction

10:50 Buzz Off, I know what I'm Doing - The Role of
Protocols in EHDI
Martyn Hyde (Canada)

11:25 Update on Electrophysiological Measures of Hearing
Sensitivity in Infants
David Stapells (Canada)

12:00 Audiologic Diagnosis of Infants: Illustrative Case
Examples
Patricia Roush (USA)

12:35 Lunch

2:05 Telehealth in EHDI: Functions and Challenges
William Campbell and Martyn Hyde (Canada)

2:40 Session Discussion

Pediatric Hearing Instrument Fitting using Modern Technologies: What, When, and Why?

Session moderator: Kevin Munro

3:00 Session Introduction

3:05 Candidacy Considerations for Modern Implantable
Hearing Technologies: An Otologist's Perspective
Craig Buchman (USA)

3:40 Earmold Considerations for Optimal Spatial Hearing in
Children who use Hearing Aids
Patti Johnstone (USA)

4:15 Directional Microphone Hearing Aid Use with School
Aged Children? - Not as Simple of a Question as it
Should Be
Todd Ricketts (USA)

4:50 Discussion

5:30 -

7:30 Poster Session and Reception

Tuesday, November 9

Pediatric Hearing Instrument Fitting using Modern Technologies: What, When, and Why? (continued)

8:30 Introduction and Announcements

8:40 Should Digital Noise Reduction be Activated in
Pediatric Hearing-Aid Fittings?
Ryan Mc Creery (USA)

9:15 New Developments in FM Systems for Infants and
Children
Leisha Eiten (USA)

9:50 High-Frequency Amplification: Sharpening the Pencil
Andrea Pittman (USA)

10:30 Break

11:00 Panel Session on Frequency-Lowering Technologies
Susan Scollie (Canada) with Panel:
Michael Boretzki (Switzerland)
Danielle Glista (Canada)
Andrea Bohnert (Germany)
Jace Wolfe (USA)

12:20 Discussion

12:30 Lunch

2:00 Pediatric Hearing Instrument Fitting in 2010:
What's New?
Stefan Launer (Switzerland) and Christine Jones (USA)

Measuring Outcomes from Intervention with Infants and Children

Session moderator: Susan Scollie

2:35 Session Introduction

2:40 Beyond Matching Targets: An Approach to Outcome
Evaluation in Pediatric Hearing Aid Fitting
Marlene Bagatto (Canada)

3:15 Understanding Early Communication Outcomes:
New Tools and Insights
Mary Pat Moeller (USA)

3:50 Measuring Auditory Performance of Pediatric Cochlear
Implant Users: What can be Learned for Children who
use Hearing Instruments?
Laurie Eisenberg (USA)

4:25 How Speech Perception Measures can Inform
Amplification Management
Josephine Marriage (United Kingdom)

5:00 Session Discussion

6:30 An Evening with Phonak

Wednesday, November 10

8:30 Introduction and Announcements

Thinking Outside the Booth

Session moderator: Melody Harrison

8:40 Session Introduction

8:45 The Family Consultant: Supporting Families from a
Non Clinical Perspective
Stephanie Olsen (USA)

9:20 Working with Challenging and Under-involved
Families
Janet DesGeorges (USA)

9:55 Parental Satisfaction, Service Quality and Outcomes
Alys Young (United Kingdom)

10:30 Break

11:00 Child and Teen Education and Counseling
Kris English (USA)

11:35 Session Discussion

Conference Endnote Address

11:45 Introduction of Endnote Address
Richard Seewald

11:50 Conference Endnote Address
John Bamford (United Kingdom)

12:30 Conference Closing

Abstracts Invited Speakers

Infant Hearing Loss in Developing Countries – Exposing a Silent Epidemic

De Wet Swanepoel

Dept of Communication Pathology, University of Pretoria, South Africa
Callier Center for Communication Disorders, University of Texas, Dallas, USA

Early hearing detection and intervention programs have become the standard of care to ensure optimal outcomes for infants with hearing loss, their families and society at large. The overwhelming majority of infants with congenital or early-onset permanent bilateral hearing loss are however born in developing countries where services are scarce and awareness poor. Risk factors for congenital and early onset hearing loss are more widespread in these regions and the estimated prevalence rate is 6 in 1000 live births. A dearth of hearing health care services mean that very few infants are afforded the opportunity of early identification for hearing loss. The overwhelming burden of infectious diseases, which characterize these regions, has meant that infant hearing loss is marginalized on healthcare agendas despite its significant contribution to the global burden of diseases. Developmental, social and vocational sequelae of unidentified infant hearing loss may ultimately prohibit societal integration and participation. Novel approaches and service delivery models must be investigated to bring sustainable and contextually relevant early hearing detection and intervention services to infants with hearing loss in developing countries.

Universal Infant Hearing Screening: Successes and Continuing Challenges

Karl White

National Center for Hearing Assessment and Management
Utah State University, Logan, USA

Permanent hearing loss is the most frequent birth defect in most industrialized countries and occurs even more frequently in developing countries. If not detected and treated within the first few months of occurrence, childhood hearing loss causes significant delays in cognitive, language and social development. With early identification and appropriate treatment the majority of affected children develop within normal limits. During the last 10 years a number of countries have implemented successful universal infant hearing screening programs. However, because of problems in ensuring timely and appropriate diagnosis, early intervention, and family support to infants who fail the screening test, many children with permanent hearing loss in these countries are not yet experiencing the benefits associated with early identification. Lessons learned over the past decade from successful programs and results of research studies will be used to describe the current status of infant hearing screening, diagnosis, and intervention programs, and suggestions will be given as to how various stakeholders (e.g., health care providers, public health officials, parents, and educators) can further improve existing programs.

Buzz off, I know what I'm Doing – the Role of Protocols in EHDI

Martyn Hyde

Mount Sinai Hospital, University of Toronto, Canada

EHDI is somewhat analogous to baking a cake in someone else's kitchen. Part science, more than a little art, the right ingredients and the right procedures each done well in the correct sequence, in the face of an array of unpredictable factors. Protocols, whether dressed up as guidelines or as standards, are someone else's idea of a recipe for success. While audiologists are up to their ears in protocols from day one, there comes a point at which individual professionals' response to them is variable and not always favourable. This is not unusual. Despite the proliferation of evidence-based guidelines or mandatory protocols, their utilization is remarkably limited. Why, so what and if a change is necessary, how to improve the situation?

This presentation is not about specific protocols, except to illustrate arguments. It is about benefits and limitations of 'protocolized' services in the EHDI context. What is the point of a protocol? When is it helpful and when not? What makes a good one? Why is uptake variable and what are the contextual, attitudinal or behavioral causes? How should protocols be developed, disseminated, supported and adapted?

In large, complex programs, there can be no systematic quality improvement without good protocols. But, they should neither threaten freedom of practice nor ignore client uniqueness. Rather, they should encapsulate key evidence and expertise, avoid reinvention of the wheel, guard against human error and liberate clinical acumen to focus upon complex aspects of practice that cannot and should not be standardized.

Update on Electrophysiological Measures of Hearing Sensitivity in Infants

David Stapells
School of Audiology and Speech Sciences
The University of British Columbia, Vancouver, Canada

The auditory brainstem response (ABR) to brief tones is currently the gold-standard method to determine frequency-specific auditory thresholds in young infants, especially those under 6 months of age. More recently, the brainstem auditory steady-state responses (ASSRs) have become of great interest in Audiology. Today's brief talk will review and update information (& issues) concerning: (i) the need for frequency-specific threshold information (as opposed to thresholds for broadband stimuli such as clicks), (ii) the importance of bone-conduction results when hearing loss is present, (iii) current results using the brief-tone-evoked ABR, (iv) current techniques and results for the brainstem ASSRs, (v) current status of the brainstem ASSRs for audiologic use, and issues limiting their current clinical application, and finally, (vi) current tone-ABR (and to a lesser extent, ASSR) clinical protocols used by the British Columbia Early Hearing Program.

Audiologic Diagnosis of Infants: Illustrative Case Examples

Patricia Roush
Department of Otolaryngology
University of North Carolina School of Medicine, Chapel Hill, USA

Over the past few decades, there has been considerable improvement in electrophysiologic procedures for assessment of auditory function in infants and young children. Even so, the behavioral assessment of hearing remains a critical and often underappreciated component of the comprehensive hearing evaluation. Through the use of case presentations, this session will illustrate the necessity of using the combination of electrophysiologic and behavioral test techniques in effective management of infants and young children with hearing loss.

Telehealth in EHDI: Functions & Challenges

William Campbell
Thunder Bay District Health Unit, Ontario, Canada

Martyn Hyde
Mount Sinai Hospital, University of Toronto, Canada

A major challenge in EHDI today is to optimize three key, related facets of program quality: effectiveness, equity and efficiency, for each service component and the linkages among them. This is especially difficult for programs addressing large areas, variable population densities and diverse cultures, under strong funding constraint. For families, easy access to service excellence is crucial. For providers, issues include their availability, training, skills development and decision support.

Modern communications technology that is readily accessible can enhance program quality in many ways, essentially by providing rapid, distributed access to clients, clinical records and specialized expertise. This can be implemented in real time (synchronously) or after any clinical encounter (asynchronously). For example, locally accessible points of service excellence can be created efficiently by direct, remote device control, video/audio procedure monitoring and support, or by direct client interaction. Difficult cases or rare and specialized test procedures can be guided on-line or the results, interpretations and next steps reviewed off-line, creating virtual centers of tertiary service. Records, reports or follow-up plans can be shared for peer discussion, second opinion, expert input or quality management. Advanced test protocols can be downloaded and instrumental or environmental problems can be

explored and addressed remotely. Web-based pools of illustrative cases or procedures can be developed and easily accessed. Provider training and skills development can be facilitated by netmeetings and other methods of distance learning, as well as by remote observation and guidance of early clinical practice. Doubtless, these are just the tip of a telehealth iceberg in the EHDI world. Some of these facets and related challenges will be discussed in the light of existing and planned telehealth implementations in the Ontario Infant Hearing Program.

Candidacy Considerations for Modern Implantable Hearing Technologies: An Otologist's Perspective

Craig Buchman
Department of Otolaryngology-Head & Neck Surgery, University of North Carolina at Chapel Hill, USA

A wide variety of implantable devices have become available for the management of hearing disorders. These devices can broadly be classified in to osseointegrated bone conduction devices, and middle ear, inner ear and brainstem implantable devices. While each of these devices has a relatively sound rationale for usage, the clinical experience and available safety and efficacy data are highly variable among both the adult and pediatric populations. Moreover, the usage of such devices must be framed within the context of a risk-benefit profile that compares these devices to non-invasive intervention methods. This presentation will outline the current state of knowledge for the various devices that are available and their potential usage today and in the future.

Earmold Considerations for Optimal Spatial Hearing in Children who use Hearing Aids

Patti Johnstone
University of Tennessee Health Science Center, Knoxville, USA

Measures of sound localization acuity offer a robust and reliable way to assess binaural function. Recent research has shown it to be an effective way to assess the efficacy of hearing aid technology in children with unilateral hearing loss. The current presentation will review an interactive method used to measure sound localization acuity in children and will demonstrate the clinical relevance of this method by presenting data from individual cases where changes in ear mold technology affected binaural performance.

Directional Microphone Hearing Aid Use with School Aged Children? Not as Simple of a Question as it Should Be

Todd Ricketts
Vanderbilt University Medical Center, Nashville, USA

In this session work examining directional microphone hearing aid use in school aged children will be discussed. Studies which have examined the potential for directional benefit and the directional benefit measured in several simulated classroom environments will be briefly considered. The benefits and limitations of current methods for maintaining optimal microphone mode in actual classroom environments including manual switching, asymmetric fitting and automatic switching will then be considered. These data along with case studies will be used to demonstrate the potential benefits and limitations of directional microphone hearing aids as used in a variety of every day school environments and as a basis for clinical recommendations related to selection and fitting of this technology.

Should Digital Noise Reduction be Activated in Pediatric Hearing Aid Fittings?

Ryan Mc Creery
Boys Town National Research Hospital, Omaha, USA

Digital noise reduction (DNR) is a term used to describe widely implemented signal processing strategies to help minimize the negative effects of environmental noise for individuals who use hearing aids. Studies with adults have suggested that while DNR does not typically improve nor degrade speech understanding in realistic environments, these algorithms may improve listener comfort in noise. Because some approaches to DNR may result in reduced gain for speech or degrade spectral cues, children could experience decreased speech understanding with this processing enabled. Recent studies evaluating the effects of noise reduction on children's speech recognition, word learning and listener ratings of comfort will be discussed. Practical verification strategies that allow clinicians to estimate the potential for gain reduction with DNR will also be presented.

New Developments in FM Systems for Infants and Children

Leisha Eiten
Boys Town National Research Hospital, Omaha, USA

A number of new developments in FM transmitters and receivers have recently become available for use with children of all ages. Clinicians must balance the use of these FM features with the changing needs of children from infancy to young adulthood. This presentation will review the current FM features available and apply their different applications across the pediatric age span.

High Frequency Amplification: Sharpening the Pencil

Andrea Pittman
Arizona State University, Tempe, USA

High-frequency amplification has the potential to increase the clarity of the amplified signal for children and adults with hearing loss; however the perceptual benefits of such amplification have been difficult to demonstrate. For children, recent research has shown that high-frequency amplification significantly improves perception of some fricatives but decreases perception for others. In related studies, the lack of high-frequency amplification is thought to be responsible for delayed fricative production in young children with hearing loss during the development of speech and language. The purpose of this presentation is to relate these findings to data from word-learning studies in which the effects of bandwidth were examined in children with normal hearing and in children with hearing loss. Results indicate that children with hearing loss learn new words at a significantly slower rate than children with normal hearing and that high-frequency amplification significantly increases the rate of word-learning. Overall, the data support the use of high-frequency amplification in children with hearing loss; however longitudinal studies with a wearable device are necessary to confirm the long-term benefits to children.

Pediatric Hearing Instrument Fitting in 2010: What's New?

Christine Jones
Stefan Launer
Phonak AG and Phonak USA

This presentation will describe current trends in pediatric hearing instrument fittings from the US. Current practices will be compared with historical surveys to see how fitting practices have evolved, how they correlate with current best practice guidelines and how fittings differ by age. Data used in this presentation were collected through a large Phonak market research tool that aggregates data points from more than 1000 fittings at pediatric clinics around the country and will be analyzed to look at how hearing instruments are fitted on children in the US. Specific topics to be addressed include the use prescriptive fitting formulas, application of features including sound cleaning technologies and frequency compression, the use of on board controls, and program use by age. More than 60 pediatric centers from around the US contributed to this project.

Beyond Matching Targets: An Approach to Outcome Evaluation in Pediatric Hearing Aid Fitting

Marlene Bagatto
National Centre for Audiology, The University of Western Ontario, Canada

The primary goal of Early Hearing Detection and Intervention (EHDI) programs is to provide effective intervention by six months of age to maximize the infant's natural potential to develop language and literacy skills. Intervention with hearing aids is a common choice among families and audiologists have access to scientifically-based strategies and clinical tools to ensure the hearing aids are fitted appropriately to the infant. Outcome evaluation is a key component of the pediatric hearing aid fitting process, however, there is little research related to what a typical outcome might be for an infant who wears hearing aids and how to systematically track the child's auditory development and performance over time. This is in part due to the lack of normed and validated outcome measures available for use with infants and children who wear hearing aids.

Recently, the University of Western Ontario Pediatric Audiological Monitoring Protocol (UWO PedAMP) was developed. This outcome evaluation guideline consists of several tools that aim to measure auditory-related outcomes in infants and children who may or may not wear hearing aids and includes the following dimensions: 1) subjective assessment of early auditory development; 2) subjective ratings of auditory performance in daily life; 3) acceptance and use of hearing aids; and 4) effectiveness of service delivery. The functional outcomes are supported by each child's hearing aid fitting information (i.e., Speech Intelligibility Index [SII]).

This presentation will describe the outcome evaluation tools included in the UWO PedAMP Version 1.0 and how the guideline is administered as part of a complete pediatric hearing aid fitting protocol. The UWO PedAMP has been implemented with children of varying ages, developmental abilities and degrees of hearing loss and the impact of these variables on outcome will be presented.

Understanding Early Communication Outcomes: New Tools and Insights

Mary Pat Moeller
Boys Town National Research Hospital, Omaha, USA

The widespread implementation of early hearing detection and intervention programs has led naturally to the development of outcome measures that are appropriate for the youngest children we serve. Additional work is needed in this area. The creation of tools for characterizing developmental change is a critical step in the advancement of evidence-based practice in early intervention. Three institutions (University of Iowa, Boys Town National Research Hospital and the University of North Carolina at Chapel Hill) are collaborating on an NIDCD-funded multi-site, longitudinal investigation of the outcomes of children with mild to severe hearing loss. As part of this project, new tools have been developed to address gaps in existing measurement batteries, increase the sensitivity of evaluation strategies and/or broaden the focus of assessments. During this presentation, the following measurement strategies will be discussed: 1) an infant vocal development interview (Moeller & Bass-Ringdahl, 2009), 2) automated vocal analysis using LENA (Language Environment Analysis), 3) elicitation probes designed to assess potentially vulnerable aspects of language development in children with hearing loss, and 4) a checklist designed to assess consistency of hearing aid use. The research team has completed the first year of data collection from this 5-year project. Preliminary data from the first year of experience with these tools will be discussed. Insights regarding the utility of these tools and implications for future tool development and clinical use will be described.

Measuring Auditory Performance of Pediatric Cochlear Implant Users: What can be Learned for Children who use Hearing Instruments?

Laurie Eisenberg
House Ear Institute, Los Angeles, California, USA

Demonstration of successful outcomes with cochlear implants and hearing aids depends to a large extent on speech perception data. Throughout the past 30 years of pediatric cochlear implantation, major effort has been dedicated to the development of new test measures and the formation of test batteries. Much of this effort was necessitated by the U.S. Food and Drug Administration requirements to demonstrate significant benefit of auditory implantable technology before premarket approval would be conferred. The need for new test development was particularly critical during the early years of clinical trials when the first generation devices were fairly crude and existing standard measures of speech perception yielded near floor effects. With each successive generation of cochlear implant technology, performance has been shown to steadily improve, necessitating further developments of clinically relevant speech perception measures to determine candidacy and track performance. In this presentation, the history of speech perception test development for adult and child recipients of cochlear implants will be described, followed by considerations in hierarchical assessment of children with auditory sensory devices. New directions in speech perception assessment will conclude the presentation. [Supported by NIH grants R01DC006238, R01DC004797, R01DC008875, R01DC009561]

How Speech Perception Measures can Inform Amplification Management

Josephine Marriage
Chear Ltd, United Kingdom

The fitting of hearing aids based on objective hearing thresholds requires an element of trust from parents of hearing impaired infants. Auditory development requires both auditory stimulation (bottom-up), via amplification, and top-down processing to allow everyday sounds to become meaningful to the child. As the child starts to evolve speech understanding parents can begin to see the real-world benefits (or otherwise) of amplification. In clinical audiology formal speech testing has typically been done as children approach school-age, though the habilitation approach may assume that speech cues are both audible and distinct, on the basis of real ear measures. The interpretation of speech test results for fine-tuning a hearing aid prescription is often more art than science in paediatric audiology, if incorporated at all. A speech test that gives a reliable measure of phoneme detection and discrimination would allow fine-tuning of the hearing aid prescription around important speech cues, including features such as frequency compression, low frequency gain or compression characteristics. Speech testing is feasible from around 2 years of age and adds important information to the hearing management options. Results from a research study using speech testing for hearing impaired subjects aged from 2 to 8 years, are presented. Analysis of the phoneme confusions give insight into the effectiveness of different hearing aid prescriptions for differing degrees and configurations of hearing loss and the use of signal processing features to optimise speech recognition.

The Family Consultant: Supporting Families from a Non Clinical Perspective

Stephanie Olsen
Bill Daniels Center for Children's Hearing
The Children's Hospital of Denver, USA

Helping families find their way back home after the diagnosis of a hearing loss can be difficult. This presentation will examine the specifics of family centered care and the role of The Family Consultant. This model ensures that families are fully integrated into planning and implementing their child's care. Incorporating non clinical support can be used as a bridge between the clinical role of the audiologist and the emotional needs of the family.

Working with Challenging and Under-involved Families

Janet DesGeorges
Hands & Voices, Colorado, USA

This session will tackle the question that every Audiologist and Early Intervention Provider asks: "What do you do with the families that don't 'follow through' or comply with recommendations from the professionals that serve them? Presented from the parent perspective, exploring the elements that have been proven to be instrumental in moving families up the continuum towards meaningful participation in their own child's development will be discussed. Additionally, this presentation will define for the participant some practical tips that lead to self-awareness as practitioners to a greater understanding of the wholistic nature of the journey of raising a child who is deaf/hard of hearing.

Parental Satisfaction, Service Quality and Outcomes

Alys Young
University of Manchester, United Kingdom

Quality early intervention is at the heart of realizing better outcomes for early identified deaf children and their families. Early diagnosis is not enough. However what counts as quality, in which circumstances and for whom remains a challenge to both intervenors and families. This presentation will address the theoretical difficulties associated with defining, measuring and predicting service quality and describe the development of a parent report instrument for evaluating service quality and its properties. The instrument includes a measure of the structure of services evaluated according to timeliness and availability; the content of intervention in relation to quantity, importance and satisfaction; and the process of intervention evaluated according extent and importance. The significance of embedding an understanding of quality within parent defined priorities and family-led outcomes is also considered.

Child and Teen Education and Counseling

Kris English
The University of Akron, Ohio, USA

"Growing up well" with hearing loss is easier said than done. It involves an additional layer of self-acceptance, addressing the definition of "me as different," and the reality that one's hearing problem is not going away. This kind of acceptance is more achievable when children and teens have supportive adults to talk to, especially when they do most of the talking. The process of "talking out one's problems" has been observed to have a positive effect on one's perception of the problem and one's ability to address it. Until those insights are obtained, new information does not get processed. This session will describe how audiologists can determine if their pediatric patients are "ready to learn" and "ready to change," and the role of the audiologist as teacher and counselor.

Abstracts Poster Session

P1 Usefulness of vestibular evoked myogenic potentials in newborns

Author(s): Lee Hui Jung, Lee Junghak

Affiliation(s): Hallym University of Graduate Studies

Background: More norms in newborns are needed for vestibular evoked myogenic potentials (VEMPs).

Aims: The purpose of this study was to investigate normative data of VEMPs in healthy newborns. We also compared newborns under 30 days with over 30 days and investigated the differences from healthy adults.

Methods: Participants consisted of 23 healthy newborns (46 ears) who passed hearing screening tests with transient evoked otoacoustic emissions and automated auditory brainstem responses and 23 healthy adults (46 ears) with normal hearing sensitivity under 20 dB HL by pure tone audiometry. VEMPs were obtained from the equipment EP25 (Interacoustics).

Results: First, the latency of p13 and n23 in newborns were 16.65 ± 2.57 ms and 26.34 ± 3.14 ms, and the amplitude of p13-n23 was 0.47 ± 0.70 μ V. Second, the P13 was significantly longer in newborns under 30 days than over 30 days. Finally, the latencies and amplitude of VEMPs were significantly longer and higher in newborns than in adults.

Conclusion: Normative data of healthy newborns were partially demonstrated. It is suggested that vestibular function test as well as hearing test be conducted to diagnose vestibular dysfunction at an early age, especially for newborns with high risk factors.

P2 Otitis media with effusion in the first year of life after referring on a newborn hearing screening

Author(s): del Valle, Tamar; Merenda, Susan

Affiliation(s): Children's Hospital Boston

Background: Casselbrant & Mandel (2003) reported that greater than 50% of infants experience otitis media with effusion (OME) in their 1st year. Engle et al (1999) reported 49% peak prevalence of OME at age 10 months. Informal observation of audiometry for returning infants, age 8 to 10 months, revealed a surprising number of OME cases, sparking an interest in whether there is a correlation between newborn hearing screening (NHS) results and incidence of OME in the first year. Aim: To determine whether NHS-referred infants who also passed the follow up diagnostic ABR with normal tympanometry, are at higher risk for middle ear problems than the published incidence of middle ear problems in the general infant population. Methods: A Retrospective study was completed for infants initially evaluated by diagnostic ABR after a NHS refer and who returned for behavioral audiometry age 8 to 10 months. Results: Out of 9 charts reviewed 44% had conductive hearing loss (CHL) with abnormal tympanograms, 22% had normal hearing with abnormal tympanograms, and 33% had normal hearing with normal tympanograms.

Conclusions: There was no greater incidence of OME in the study population than the published statistic for incidence of OME in children under 1 year old.

P3 Public Hearing Health Care Service in Brazil: The importance of initial processes to family engagement in the early intervention program

Author(s): Figueiredo, Renata de Sousa Lima; Cavanaugh, Maria Carolina Versolatto; Novaes, Beatriz Cavalcante Albuquerque Caiuby; Mendes, Beatriz de Castro Andrade

Affiliation(s): Catholic University of São Paulo, PUC-SP, Brazil

To describe the transition processes from diagnosis to hearing aid fitting and beginning of intervention in a population of children of low income families. It aims at discussing key factors involved teamwork when establishing auditory thresholds, verification and validation of hearing aid prescription, leading to engagement in intervention. Method: Fifteen case-evaluation of children aged between 0 and 2 years who were diagnosed at Brazil's center for Hearing in Children. Duration of diagnostic processes, hearing aid fitting and validation integrated with the intervention will be described and discussed in relation to: auditory and early language skills. Results: This process took an average of two to four months with one session per week, depend of the presence of other handicaps, family understanding of the program, degree of hearing loss, among others. Studying these procedures within the hearing health care service becomes important do it to new regulation mandates newborn hearing screening program that, in time, will increase the demand.

P4 The high prevalence of otitis media with effusion in children with cleft lip and palate as compared to children without clefts

Author(s): Flynn Traci¹, Möller Claes², Jönsson Radi³, Lohmander, Anette⁴

Affiliation(s): ¹Institution for clinical neuroscience and physiology, Department of Audiology, Gothenburg, Sweden
²The Swedish Institute for Disability Research, Örebro University Hospital, Örebro, Sweden
³Sahlgrenska University Hospital, Department of Audiology, Gothenburg, Sweden
⁴Institution for clinical science, intervention and technique, CLINTEC, Karolinska Institute, Stockholm, Sweden

Objective: Children with cleft lip and palate (CLP) universally present with OME. This prevalence has not been systematically studied. The purpose of the present study was to examine and compare the prevalence of OME, hearing sensitivity, and audiometry methods utilized for assessment in children with and without clefts.

Methods: Two groups of children (UCLP, N=22, and without clefts, N=20) were followed prospectively from 1 to 5 years of age. Data were collected at four points including: (1) otomicroscopy, (2) tympanometry, and (3) hearing assessment.

Results: The children with UCLP demonstrated a significantly higher prevalence of OME than children without clefts. Of those ears with OME, 83.1% exhibited a hearing loss, with this loss more prevalent in the cleft group. Children with UCLP utilized a lower age-appropriate audiometry testing method than children without clefts at younger ages.

Conclusions: This presentation highlights the findings of children with UCLP demonstrating a significantly higher prevalence of OME than children without clefts and the hearing loss associated with OME. Finally, the method of audiometry utilized with both groups of children will be presented and discussion will include if a greater period of hearing loss in the UCLP children may lead to a slower cognitive development.

P5 Ease of listening and speech recognition for normal hearing children with digital noise reduction

Author(s): Gustafson, Samantha¹; McCreery, Ryan²; Hoover, Brenda²; Kopun, Judy²; Stelmachowicz, Pat²

Affiliation(s): ¹Arizona State University; ²Boys Town National Research Hospital

Digital noise reduction (DNR) algorithms aim to improve signal to noise ratio (SNR) to improve speech recognition and listener comfort in noise. This is especially important for children, who require a better SNR than adults to achieve similar levels of speech recognition. Because DNR has been found to provide no improvement or decrement in speech recognition, focus has turned to the effects of DNR on listening effort. The purpose of this study was to examine how DNR algorithms providing different amounts of SNR improvement affect speech recognition and listening effort. Twenty-four normal hearing children (ages 7-12) participated in a speech recognition task using consonant-vowel-consonant nonwords in background noise. Nonwords were recorded through two hearing aids with DNR-off and DNR-on at two SNR (0 dB and +5 dB) to produce experimental stimuli presented to listeners. Verbal response time was measured from recorded responses to examine listening effort. Results revealed a significant improvement in phoneme recognition with DNR in the device with the greater SNR improvement. A decrease in listening effort was found with DNR in both devices. Overall, results suggest that, unlike improvement in speech recognition related to DNR, reduced listening effort is not dependent upon improvement of SNR.

P6 Outcomes of children with mild-moderate hearing loss: Year one

Author(s): Harrison Melody¹, Patricia Roush¹, Moeller Mary Pat²; Tomblin Bruce³, Bentler Ruth³, Stelmachowicz Patricia²

Affiliation(s): ¹The University of North Carolina; ²Boys Town National Research Hospital, ³The University of Iowa

In 2008, the U.S. National Institutes for Health funded a five year, multi-center grant to study the moderators of outcomes of children with mild-to-severe hearing loss. Although the majority of children in the U.S. have hearing loss in this range, the requisite clinical studies needed to describe the factors influencing outcomes for this group of children have not been conducted. Much of what we know about children with mild-to-severe hearing loss is based upon research conducted 15-20 years ago, prior to implementation of newborn hearing screening, access to early intervention, and the technological advances found in current hearing technologies.

One of the largest known contributors to outcomes in children with hearing loss is reduced auditory /linguistic experience. Thus, a primary the focus of the study is to examine variations in the delivery and effectiveness of early services including hearing aid fitting and use, and early intervention services. A comprehensive set of child outcome measures (e.g., speech perception and production, language, academic, psychosocial, cognitive) and family outcome measures (parenting, satisfaction with services, and quality of life) that support early development are being collected. Selected data from the first 12 months of testing will be presented.

P7 My patient is taller than me! Now what? Developing a plan for teenagers to transition to adult audiology services

Author(s): Schroeder Kristen, Rall Eileen, Montoya Louise, Reyes Jose
Affiliation(s): The Children's Hospital of Philadelphia

Background: Throughout the "teen" years, adolescents are faced with the dual challenges of establishing their sense of identity and starting their transition to adulthood. These challenges may be magnified when a teenager is hearing impaired.

Aims: As audiologists, we can support our teenage patients as they plan and transition into adulthood. Our teen patients should understand the impact their hearing loss has on communication and how to relay that information to educators, healthcare providers, and others.

Methods: Audiologists should collaborate with teens and their families to develop a comprehensive transitioning plan. This plan should be driven by patient and family needs and can be used to promote understanding of the impact of hearing loss on alerting and safety, independent use of equipment, self-advocacy when communication needs arise, problem-solving skills and using multiple forms of communication and preparedness for emergency situations. Resources available through PEPNet and the GAP learning guide will be highlighted.

Conclusions: Audiologists can support our teen patients by engaging them as young adults in discussions about life in general, post-secondary education support, and transition planning for adulthood. This poster highlights strategies for developing a transitioning plan.

P8 Influence of Polish Universal Neonatal Hearing Screening Program on early cochlear implantation in Poznań, Poland

Author(s): Sekula Alicja¹, Karlik Michał¹, Wiskirska-Woźnica Bożena¹, Szyfter Witold², Szyfter-Harris Joanna¹, Wróbel Maciej²

Affiliation(s): ¹Department of Phoniatics and Audiology,
²Department of Otolaryngology; Poznań University of Medical Sciences, Poznań, Poland

Owing to the initiative of the Polish citizens and support of the Great Orchestra of Christmas Charity Foundation – a charitable organization, the National Universal Neonatal Hearing Screening program in Poland was introduced. The program began in the end of 2002 in all neonatal units in Poland and screened all newborn children. After 7 years of running the program (between 2003 and 2009) a total number of 2,698,491 children were screened for hearing impairment, what stands for 98.52% of all delivered babies, registered in Poland.

The program enabled early audiological intervention, including hearing aids fitting as well as cochlear implantation in cases of bilateral profound hearing loss.

Department of Phoniatics and Audiology in Poznań is a center of the second and the top, third level of the programme. At the moment over 3000 children were examined. 61 children at the age below 24 months were qualified and implanted till the end of August 2010.

Audiological results from three levels of the program are presented, as well as rehabilitation methods used before decision of cochlear implantation.

Mean age of children implanted before and after 2003 is presented. The important decrease of the age of children diagnosed and implanted was noticed.

Usefulness of Universal Neonatal Hearing Screening Program for early audiological intervention, as well as early cochlear implantation is emphasised.

P9 The relation between the time duration usage of hearing aids of children in therapy and the therapy's efficiency

Author(s): Cilmara CAC Levy; Priscila ML Capps

Affiliation(s): ISCMSP- Brazil

Introduction: The technological advance of hearing aids provided many benefits for individual adaptation in children. Nowadays, it is possible to have better control over the therapeutic efficiency by using the Datalogging program that stores data and reports the average hearing aids use.

This study is aimed to assess the relationship between the time of hearing aid usage along with the children's speech therapeutic process at the Brotherhood of Santa Casa de Misericórdia de São Paulo.

Method: This study was conducted at the Speech Therapy Clinic of the Brotherhood of Santa Casa de Misericórdia de São Paulo.

Study participants were 9 children between the ages of 1 to 5, six females and 3 males. The evaluation criteria used was hearing aids Naida SP/UP Phonak and all the children are being seen and follow up at the clinic. The study was conducted by using analysis data from Datalogging program. The data collection was done on a weekly basis for a period of a month.

Results: The results showed that not only where the parents informed about hearing aid usage but also they did not use them as we hoped they would, therefore reaching a relatively low average of daily use. Weekly orientation will make it possible for the children's effective usage of hearing aids, allowing a closer dialogue with the parents and making the family more committed, responsible and in partnership with the Speech Therapy Clinic to use the hearing aids correctly.

Conclusion: This is a great ally for the audiologist team and family of evidence for more successful hearing aids outcomes.

P10 Sound Field Initiative: How to win teachers and influence administrators

Author(s): Frankie Mickelsen

Affiliation(s): Prince George's County Public Schools, Maryland

This poster will provide information and statistics on Sound Field Amplification in the general education classroom. The rationale will be given as to why sound field amplification is an important asset to a classroom; the benefits of such technology; the goals of providing this technology to kindergarten and first grade classrooms; the methods used to install and train general education teachers on its use; results of installing the technology system-wide; the sources of funding (which is the main point in school budgets); results and testimonials of teachers; and conclusions.

P11 Bridging the research to clinical practice gap: Use of the Network of Pediatric Audiologists of Canada to facilitate the development of the UWO Pediatric Audiological Monitoring Protocol (UWO PedAMP v1.0)

Author(s): Sheila T.F. Moodie¹, Marlene Bagatto¹, Susan Scollie¹, Richard Seewald¹, Anita Kothari², Linda Miller³ and The Network of Pediatric Audiologists of Canada

Affiliation(s): ¹National Centre for Audiology, Faculty of Health Sciences, University of Western Ontario, London, Canada
²Faculty of Health Sciences, University of Western Ontario, London, Ontario, Canada
³Faculty of Health Sciences and School of Graduate and Postdoctoral Studies, University of Western Ontario, London, Ontario, Canada

In 2009, researchers in the Child Amplification Laboratory at The University of Western Ontario began development of a pediatric audiological monitoring protocol (the UWO PedAMP) to be used with children with permanent childhood hearing impairment (PCHI). One of the main objectives during the development phase of this project was to proactively address any barriers that could be foreseen to clinical implementation of the UWO PedAMP guideline. Analyses of barriers to practice change indicate that obstacles to change arise at many levels, including the level of the guideline (ex.relative advantage, trialability); the individual practitioner (ex. habit), the organization (ex. staff turn-over), and the wider practice environment (ex. support for change). In an effort to address this knowledge-to-clinical action gap, we partnered with pediatric audiologists across Canada in a dynamic, interactive and iterative process to ensure that factors influencing uptake of the UWO PedAMP in practice could be identified, better understood and addressed during the initial development phase. This poster presents the results of this project. Barriers to implementation of the individual components of the UWO PedAMP v1.0 at the guideline, practitioner and organization levels were identified by the Network Clinicians and modifications where possible were made to the UWO PedAMP.

This poster presents the results of this work and will describe the knowledge-to-action framework and results of the individual assessment of each of the measures included by the pediatric audiologists across Canada. In addition a description of how this collaborative and dynamic approach facilitated the development of version 1.0 of the UWO PedAMP will be provided.

P12 Development of Universal Newborn Hearing Screening Programme in Republic of Macedonia

Author(s): Femikj Natasha¹, Chakar Marina²

Affiliation(s): ¹National coordinator of NHSP of RMacedonia;
²Centre for Audiology of the University ENT Clinic, Skopje, Macedonia

Introduction: Despite of the difficult economic situation ,transition and efforts of the country on its road to join the Europe Union the Government and Ministry of Health of the Republic of Macedonia recognized and accepted the importance of NHSP.The initiative for introduction of the Universal newborn screening programme and for purchasing of hearing screening equipment came from Natasha Femikj,audiologist from Bitola (the Ministry of Health appointed her as a national coordinator).

The equipment-screening TEOAE-OtoRead,Interacoustics- was delivered to the hospitals in 3 cities: Bitola, Tetovo and Strumica. Audiology Center of University ENT Clinic in the main city-Skopje was supplied with diagnostic ABR,Interacoustics .In the Republic of Macedonia an annual birth rate is approximately 23000 newborns.In Bitola for 2009 an annual birth rate was 1300;for Tetovo 2200 and for Strumica 1300 newborns.

Aim: NHS Programme started on January 12, 2010 as Universal NHS Programme for both babies with no risk and those at risk of hearing impairment. The Government will continue with the development of the Programme and in the next phase the Ministry of Health will supply screening TEOAE for next 3 cities in the country. Our goal is to

reduce the age at which infants with hearing loss were diagnosed and treated in the Republic of Macedonia. Methods :The protocol consisted of three stages. In the first two stages newborns were tested with transient click-evoked otoacoustic emissions. The first TEOAE test was performed by 24h of age(before discharge from hospital). The second one after 30 days in case of referral (in some cases babies were screened with the second TEOAE before the discharge from the hospital).The third stage was performed by diagnostic ABR ,for those babies who failed the second TEOAE stage.

Results:The whole number of screened babies is 570: 527 without risk and 43 at risk of hearing impairment. Bilateral hearing impairment was identified in 5 newborns (2 from the no-risk and 3 from the at-risk population). Unilateral HL was found in 2 newborns from at-risk population.

Conclusions:The results show that the introduction and implementation of a hospital-based, universal neonatal hearing screening programme in the Republic of Macedonia, is feasible and effective. All these support our wish and determination to work dedicated on further development of the NHS in the country.

P13 The importance of sensitive test methods for determining benefits of high frequency audibility

Author(s): Myriel Nyffeler, Michael Boretzki, Nicola Schmitt, Frederik Eichhorn, Julia Rehnmann, Andrea Kegel and Katrin Meisenbacher

Affiliation(s): Phonak AG, Stäfa, Switzerland

The effectiveness of Phonak's proprietary nonlinear frequency compression algorithm, SoundRecover, has been documented for a wide range of hearing losses in various independent studies. SoundRecover allows a portion of the incoming sound above a particular cut-off frequency to be compressed and shifted to lower frequencies, whereas no frequency changes are made for sounds below the cut-off frequency. However, to measure high frequency speech cues such as the consonants /s/, /z/, /sh/, /f/, /d/, /k/ and /t/, more sensitive test methods are necessary since conventional sentence and word test have the weakness that single phonemes can be discerned on the basis of word or sentence contexts. Here, the Adaptive Logatome Test and the University of Western Ontario (UWO) plural test are discussed as sensitive test methods to evaluate consonant identification and detection with SoundRecover. Phonak's Logatome test uses an adaptive presentation level and measures the respective identification thresholds of various consonants in nonsense syllables in dB SPL, whereas the UWO plural test uses a fixed control of the presentation level and measures the detection of plural words which are represented as percentage correct. To determine the strengths and limits of evidence about the effectiveness of measuring identification and detection thresholds for high frequency speech cues/ consonants the two tests are discussed in terms of sensitivity, application, age appropriateness, language ability needed, duration of the test, test setups and the use of the data for each. Together, they offer an effective and sensitive test battery to evaluate high frequency audibility and, therefore, benefits of SoundRecover for a wide range of hearing losses.

P14 Development and adaptive behavior in youngchildren with hearing loss: Study design and preliminary data

Author(s): Johnson, Karen¹; Eisenberg, Laurie¹; Stika, Carren²; Henning, Shirley³; Colson, Bethany³; DABCHL Investigative Team^{1,2,3}

Affiliation(s): ¹House Ear Institute; ²San Diego State University; ³Indiana University School of Medicine

Development and Adaptive Behavior in Young Children with Hearing Loss is a prospective investigation designed to identify factors leading to successful outcomes in young children with mild to severe hearing loss. The study combines longitudinal and cross-sectional designs to determine the developmental trajectories of social-emotional and adaptive functioning in young hard of hearing children (HH) from infancy to preschool age. Children between 12 and 48 months of age currently are being enrolled from two investigational sites: the House Ear Institute and

Indiana University School of Medicine Children. Normal hearing children (NH) serve as controls. Children are assessed at annual intervals within the domains of audition, speech perception, language, cognition, social-emotional development, and adaptive functioning. Parents are assessed in terms of their involvement and self-efficacy, emotional availability, and language input. Factors related to intervention services are also being delineated. Preliminary data analysis has shown little difference between the HH and NH groups on most measures. However, a difference has been observed in the domain of social-emotional competency (i.e., compliance, empathy, prosocial peer interactions, mastery motivation, play skills, and attention), based on parent ratings. This early finding may point to the importance of tracking social-emotional development in young children with hearing loss.

P15 Emotion recognition and theory of mind in children with hearing loss

Author(s): Porter, Heather¹; Tharpe, Anne Marie¹; Sladen, Douglas²

Affiliation(s): ¹Vanderbilt University; ²University of Texas at Austin

Psychosocial development tends to be influenced by speech and language ability, but other factors might also influence development of social and emotional abilities in children with hearing loss. This study examined two specific aspects of social cognition, emotion recognition and Theory of Mind (ToM), in 41 children within two age groups (i.e., 4–6 years and 10–12 years) with and without hearing loss. Younger children with hearing loss had lower emotion recognition scores than younger children with normal hearing. Children with hearing loss demonstrated an understanding of knowledge access, false-belief, and real-apparent emotion in the same sequence as children with normal hearing, but did so at later ages. Empirical review of data comparing emotion recognition scores and ToM scores showed that the relationship was not linear. The data were fit to a logistic regression model suggesting that children begin to successfully complete ToM tasks once they reach $\geq 67\%$ accuracy on the emotion recognition task. These results support past findings that showed children with hearing loss tend to have lower emotion recognition and ToM scores than their peers with normal hearing. In addition, they extend past knowledge in this area by suggesting a non-linear association between emotion recognition and ToM.

P16 Evoked potential and behavioral measures of auditory processing in children with auditory processing disorders: Test-retest reliability and training effects

Author(s): Suzanne C. Purdy¹, Mridula Sharma²; Andrea S. Kelly^{1,3}

Affiliation(s): ¹University of Auckland; ²Macquarie University; ³Auckland District Health Board

School aged-children with suspected auditory processing disorder were assessed on three occasions, two times before and once after a 6-week intervention. Participants aged 7 to 13 years were randomly assigned to a control group or to one of the treatment groups receiving one of two types of training (discrimination and phonological awareness training versus language therapy), with and without personal FM. Bilateral FM systems were worn during school hours for the two groups receiving training plus FM. Both training approaches resulted in positive outcomes for various language, auditory processing and phonological awareness measures, as did the use of personal FM systems. Cortical auditory evoked potentials (CAEPs) to speech in noise showed significant test-retest differences in N250 amplitudes, consistent with passive auditory training effects previously reported for adult listeners undergoing CAEP testing. Systematic changes in CAEPs were seen across the three test sessions (i.e. during the baseline period and after treatment), making it difficult to evaluate treatment effects based on the evoked potential findings. In addition to showing the benefits of interventions for APD, the results highlight some of the barriers to showing treatment effectiveness such as test-retest variability and passive training effects of testing.

P17 Young children's attitudes towards their peers who wear hearing aids

Author(s): Rentmeester, Lindsey; Tharpe, Anne Marie

Affiliation(s): Vanderbilt University Medical Center

The "hearing aid effect" is a phenomenon that describes negative attitudes toward children wearing hearing aids when compared to their normal hearing peers. The hearing aid effect has been found in adult observers and child observers as young as 10 years of age. The purpose of this study was to determine whether the hearing aid effect is present in young children and if there is a difference between the attitudes of young children (aged 6–7 years) and older children (aged 9–10 years). Children with normal hearing were asked to rate photos of their peers with a hearing aid and without a hearing aid in social acceptance, and physical and cognitive competence. The findings from this study suggest that when directly compared to their peers without hearing aids, children who wear hearing aids are more likely to be viewed as being less capable physically and may be less socially accepted by their peers [Supported by the NIH National Institute on Deafness and Other Communication Disorders (NIDCD) Short Term Research Traineeship (T35)].

P18 Pediatric bilateral cochlear implantation: A qualitative study of communication outcomes and functional benefit

Author(s): Scarinci, Nerina; Hickson, Louise

Affiliation(s): The University of Queensland, School of Health and Rehabilitation Sciences, Communication Disability Centre, Australia

In recent years, an increasing number of profoundly hearing impaired children are receiving bilateral cochlear implants (CIs). Such a fitting provides a range of potential benefits over a single cochlear implant, including improved detection of low-level sounds, improved localization, and improved speech recognition in noise. However, little is known of the benefits of bilateral implantation over unilateral implantation in regards to communication outcomes and functional benefit. This exploratory study aimed to examine the functional benefits of bilateral cochlear implantation and determine whether there were identifiable improvements in auditory and speech production behaviours in children with severe to profound bilateral hearing loss, who received sequential bilateral cochlear implants. Data was collected for 11 children from an early Auditory-Verbal Therapy Intervention centre. Families participated in semi-structured in-depth interviews and findings were compared with results obtained from modified versions of the Meaningful Auditory Integration Scale (MAIS) and Meaningful Use of Speech Scale (MUSS). Analysis revealed a wide range of benefits for children, however the outcomes were highly variable, depending on age of implantation and interval between first and second implant. The study also highlights the advantages of using qualitative methods to explore the benefits of bilateral amplification.

P19 Stability and symmetry of hearing loss in children with enlarged vestibular aqueduct

Author(s): Lisa P. Soslow¹, Kathleen M. Lewis¹, Dinah Clark², Ian Krantz²

Affiliation(s): ¹The Children's Hospital of Philadelphia Center for Childhood Communication
²The Children's Hospital of Philadelphia Division of Human Genetics

Background: Enlarged Vestibular Aqueduct (EVA) is the most common radiographic abnormality in children with sensorineural hearing loss (SNHL). Several studies have shown that people with EVA can have progressive and/or asymmetrical hearing loss. We analyzed the stability and symmetry of hearing loss found in children with EVA. Methods: Chart reviews were completed for 851 children, age 6 months – 21 years, seen at The Children's Hospital of Philadelphia from 1999 to 2010. Serial audiograms were analyzed for 101 children identified with bilateral SNHL and bilateral EVA as well as a group of 46 children with bilateral SNHL but no genetic findings or EVA. Progression was defined according to the ASHA guidelines for Audiologic Management of Individuals Receiving Cochleotoxic Drug Therapy. Asymmetry between ears were defined as air conduction threshold differences of > 10 dB at one frequency for two or more consecutive audiograms. Results: Both progression and asymmetry of hearing loss were more common in the group of children with EVA compared to the group of children without EVA. Conclusions: Audiologist should be cognizant of the increased risk for progression and asymmetry of hearing loss in children with EVA. Counseling and management strategies should address these hearing loss characteristics.

P20 Pure tone average and aided speech intelligibility index as predictors of vocabulary size

Author(s): Stiles, Derek Jasona; Bentler, Ruth A.b

Affiliation(s): Rush University, Chicago, ILa; University of Iowa, Iowa Cityb

Children who use hearing aids have smaller vocabularies than children with normal hearing. The correlation between degree of hearing loss and vocabulary is inconsistent at best. We were interested whether the aided speech intelligibility index (aSII) could be a stronger predictor of speech perception and vocabulary than pure tone average (PTA). Children are more likely to be exposed to meaningful word learning opportunities while wearing their hearing aids, hence the hypothesis that aSII will correlate more strongly to speech perception and vocabulary appears valid. Sixteen children between 6 and 9 years of age fit with bilateral amplification were enrolled into the study. The aSII was obtained at the child's user settings using Audioscan Verifit electroacoustic analyzer. Speech perception was measured with the Lexical Neighborhood Test (a word repetition task). Receptive vocabulary was measured with the Peabody Picture Vocabulary Test. Stepwise regressions demonstrated that aSII provided a significant unique contribution beyond PTA alone to the prediction of receptive vocabulary but not word repetition. Unlike word repetition, vocabulary size is the culmination of multiple word learning events. The cumulative effect of missed word learning opportunities associated with hearing loss may be reflected in components of the aSII beyond degree of hearing loss.

P21 The effect of nonlinear frequency compression on the imitation of English fricatives measured as a function of acclimatization time

Author(s): Jacob Sulkers, Danielle Glista, Melissa Polonenko, Susan Scollie

Affiliation(s): National Centre for Audiology, The University of Western Ontario

The fricatives /s/ and /ʃ/ are high-frequency and relatively less intense than many other speech sounds. Due to limitations in bandwidth, perception of high-frequency speech sounds is not always possible with current hearing instrument technology. Individuals with hearing loss using current hearing instrument technology may not perceive these sounds and thus may not produce them. Nonlinear frequency compression (NFC), a type of frequency lowering technology, compresses the high-frequency output bandwidth of a signal. Research suggests use of hearing instruments with NFC technology may lead to changes in speech sound perception and production. The aim of this study was to examine the time course effects of NFC processing on the imitation of the fricatives /s/ and /ʃ/ in five English-speaking children with sloping, high-frequency hearing loss. An acclimatization period to NFC processing of approximately 16 weeks was allotted to all participants. Acoustic analyses of speech samples were conducted across the 16-week period. Degree of change was measured over time and results were compared to normal hearing peers. Results suggest an acclimatization effect associated with speech production performance for some participants over the 16-week period.

P22 Using electroacoustic FM verification measures to assess the cross-compatibility of FM system components

Author(s): Symington, Linda; DeConde Johnson, Cheryl

Affiliation(s): Central Michigan University

An increase in the use of FM technology in the educational setting has led to children with different auditory needs co-existing in the same classroom. At times, this may require combining equipment from different manufacturers. Currently there is no industry standard for the design of FM systems to insure cross-compatibility or for their electroacoustic assessment; however, there is an assumption made by some consumers that basic compatibility exists. In this study FM systems from three different manufacturers were coupled to ten different hearing aids. The verification protocol described in the American Academy of Audiology Hearing Assistance Technology (HAT) Guidelines was used to evaluate FM transparency. Depending on the receiver used, transparency was found to be within recommended tolerances ($\leq \pm 2$ dB) in 35-60% of the fittings when manufacturer defaults ("out of the box") gain settings were used. Once transparency was achieved, via receiver gain adjustment, the effect of substituting a transmitter from another manufacturer revealed great variability. Transparency was obtained in 0 to 90% of the aids in this sample, depending on the specific receiver + transmitter combination, indicating the need for additional receiver gain modifications. Qualified personnel are necessary for appropriate FM fittings and management.

P23 A survey of continued amplification use by individuals fitted with hearing aids as school-age children

Author(s): Tatsuo Nakagawa

Affiliation(s): Yokohama National University, Japan

Nobody denies the importance of early detection of hearing loss and the fitting of amplification at the earliest age possible. The objective of this study was to examine how children who received audiological and educational support during their school-age years continued to use their amplification over time and later in life. The survey questionnaire distributed investigated the individual's daily use of hearing aids, obtained information about audibility of speech and sounds in their everyday environments and gathered information about the communication strategies they employed in various situations. 74% of distributed surveys were returned. The age range of respondents was 15 to 46 years of age; with 78% below the age of 30 years. The hearing losses ranged from mild to severe with an average mean hearing threshold level of 81dB (SD 20dB). More than 72% of respondents reported wearing their hearing aids on a daily basis. 4.6% of respondents reported that they no longer used hearing aids. Results of this survey indicate that for some individuals in certain situations a reliance on manual communication was used effectively. Results also show that children with mild-to-severe hearing loss who are provided with audiological and educational support during their school years are included into a hearing society.

P24 ASSR in the diagnosis and implanting prostheses of hearing loss among children

Author(s): Tomasz Broda^{1,2}, Emilia Kańska¹, Marcin Szymański^{1,2}, Zygmunt Pęczak¹

Affiliation(s): ¹Centre for Diagnosis, Therapy and Rehabilitation of Hearing and Speech, NZOZ SŁUCHMED, Lublin, Poland; ²Department of Otolaryngology, Medical University, Lublin, Poland

The development of methods for objective assessment of hearing loss has significantly expanded the diagnostic options in audiology. Among the standard tests in clinical practice an important role has been played recently by a group of testing using the auditory brain stem responses (ABR). Recently ASSR (auditory steady state responses) has aspired to the group of tests examining auditory potentials. Determination of the hearing threshold with this method is a good tool in the audiological diagnosis of infants and young children.

At our Centre in Lublin, ASSR tests were performed in the youngest patients, in order to assess the results of steady-state potentials in comparison with ABR and pure tone audiometry tests (PTA). The usefulness of this method was rated in implanting prostheses in small children.

In the performed analysis a statistically significant correlation of ABR and ASSR as well as pure tone audiometry was obtained. In children with hearing loss ASSR test provided the relevant information useful for the selection of hearing aids. This method, due to confirmation of compatibility with other audiological research may, in our opinion, be a reliable method in assessing the threshold of hearing in children.

P25 Infant-toddler hearing screening in the pediatric medical office

Author(s): Bhatia Parul¹, Mintz Sandra², Hecht Barbara², Vastano Russell³, Kuo Alice⁴

Affiliation(s): ¹USC Keck School of Medicine, Division of General Pediatrics, Childrens Hospital Los Angeles, Los Angeles, California
²John Tracy Clinic, Los Angeles, California
³UCLA Center for Healthier Children, Families and Communities, Los Angeles, California
⁴David Geffen School of Medicine at UCLA, UCLA School of Public Health, UCLA Center for Healthier Children, Families and Communities

Through collaboration between audiology and pediatric medical teams to facilitate early identification of post-natal onset hearing losses in infants and toddlers missed by UNHS, this study aimed to determine the ability of physicians to incorporate objective hearing screening in well-child checks.

Medical personnel screened children aged 2 months to 3 years during well-child visits using a risk-factor questionnaire, OAE, tympanometry and acoustic reflex measurements. Results were used to identify children in need of close audiological follow up.

Among 1965 OAE screens, 205 (10%) patients failed in at least one ear. Tympanometry showed middle ear effusions were present in 102 (50%) of these cases, while 45 (22%) cases raised concerns for sensorineural hearing loss. Five patients were found to have sensorineural hearing loss. Screenings were completed in less than 10 minutes 75% of the time, and physicians accurately interpreted results in 83-89% of cases.

Findings demonstrate infant-toddler hearing screening in the pediatric office is effective in identifying cases of post-natal hearing loss. Supplementing OAE screenings with tympanometry allows the physician to better triage patients for immediate audiology referral. Guidelines for physicians should be re-examined to incorporate use of objective hearing screening measures for infants and toddlers in the pediatric office.

P26 The Northeast Ohio Consortium for children with cochlear implants: An innovative interagency action group created to facilitate communication between stakeholders involved with children with cochlear implants. Group initiatives include development and oversight of the communication exchange system, education for educators of children with cochlear implants and outreach.

Author(s): Brotman-Domoracki Sandi¹, Dunay Jane²

Affiliation(s): ¹Family Child Learning Center, a program of Akron Children's Hospital in association with Kent State University, ²Beachwood City Schools and the Regional Consortium for the Hearing Impaired, Beachwood, Ohio, USA

The need for communication between all parties involved with children who use cochlear implants is well documented. The short list of stakeholders includes the child, family, audiologist, early intervention service providers, cochlear implant team, speech language pathologist, special education teacher, general education teacher and other school personnel. The Northeast Ohio Consortium for Children with Cochlear Implants was developed out of a call to action by the Regional Infant Hearing Program in Northeast Ohio to facilitate communication between these parties. The goal was for a method of communication that was expedient, clear, concise and useful. Eighty participants from over 25 facilities including schools, hospitals and agencies attended the inaugural meeting in 2006. NOCCCI was born, an information exchange system was developed, an education forum series was launched and professional stakeholders have developed strong supportive relationships that continue to support the advancement of children with cochlear implants. This poster session will feature the steps taken to develop this organization including such a diverse group, the three main communication forms in use and current and future projects of NOCCCI.

P27 Noise induced hearing loss and hearing conservation programs in schools

Author(s): Roberts, Lindsay; Lass, Norman

Affiliation(s): West Virginia University, Children's Hospital of Pittsburgh

The intention of this paper is to discuss noise-induced hearing loss and its effect on the school-age population. A questionnaire was constructed by the investigator and sent to randomly selected elementary, middle and high school principals as well as career/technical center principals in Ohio, Pennsylvania, Maryland, Virginia, and West Virginia. The questionnaires were designed to assess knowledge of noise-induced hearing loss and to determine if any hearing loss prevention programs are in use at the respondents' schools. A total of 600 surveys were sent and 91 principals responded. Results indicated that in general, principals are knowledgeable about noise-induced hearing loss and its consequences, although programs are not in place to educate students. Hearing conservation programs can effectively increase children's knowledge of hearing and hearing loss prevention strategies and practices. A variety of hearing loss prevention programs is available although not widely used. Efforts need to be made to reduce the incidence and prevalence of noise-induced hearing loss in the school-age population.

P28 Quality indicators of hearing health services in Brazil: Impact of early diagnosis in language outcomes in low income populations.

Author(s): Cavanaugh Maria Carolina Versolatto, Novaes Beatriz Cavalcante Albuquerque Caiuby, Mendes Beatriz de Castro Andrade

Affiliation(s): Catholic University of São Paulo, PUC-SP, Brazil/ Children's Hearing Center (CeAC / DERDIC)

The scope of services offered by hearing health care providers in Brazil includes diagnosis, hearing aid fittings, and intervention. However, economic burdens are incurred by low income families, including direct and indirect expenses (transportation, batteries, maintenance, and loss of work). Language development monitoring of young children with hearing impairment is one of the greatest challenges, due to an interaction of variables related to the therapeutic process. Objective: To describe and discuss variables related to language outcome, including actual adherence to amplification and treatment, family involvement, and medical and audiological aspects. Thirty children with hearing loss, age 6 to 48 months were studied at the Center for Hearing in Children, using scales for family involvement and satisfaction, IT-MAIS, MUSS, and hearing aids data log. Approximately 81% of families were satisfied with auditory development, even though language development was poorer than expected. Only a few reported not being satisfied, mostly parents of children with profound losses. Data logging of hearing aids revealed that many children were using the device only a few hours per day. In conclusion, the implementation of follow-up strategies within the community based health centers can further promote commitment to use of hearing aids and intervention.

