

EEEEK!
**There's a Cochlear Implant
Recipient in My Office!**

Part 1
Managing Mismatched Expectations

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**Quote from the Introduction to
*Bridge to Sound with a Bionic Ear***

“...cochlear implant technology that has revolutionized hearing healthcare for those who are profoundly hearing impaired and unable to benefit from hearing aids.”

Dr. Robert Schindler

***With Implant,
She Doesn't Miss a Beat***

“Its a miracle device, but you have to put in the hard work to make the miracle happen.”

Caitlin Parton
NY Times, August 1, 1999

**Cochlear Implants in Adults and Children.
NIH Consensus Statement**

“There is substantial unexplained variability in the performance of implant users of all ages...”

Online 1995 May 15-17 [2009, December 27]; 13(2):1-30.

Definition of “Success”

Matching expectations
and outcomes

Achieving “Success”

Inherent variability in patient outcomes interacts with evolution of the technology, changes in expectations, and changing practice patterns to create significant challenges for audiologists as they work to assist recipients in achieving not just benefit, but success.

Evolution of Cochlear Implant Technology

- In 1985, Cochlear Corporation's Nucleus 22 cochlear implant system became the first multichannel cochlear implant to receive FDA approval for use in adults.
- In 1990, the FDA approved the Nucleus 22 system for use in children.

Evolution of Cochlear Implant Technology

- In 1995, Advanced Bionics' Clarion Multi-Strategy Cochlear Implant received FDA approval for use in adults.
- In 1997, the Clarion system received FDA approval for use in children.
- Advanced Bionics' entry into the market place marked the advent of competition in the cochlear implant industry.

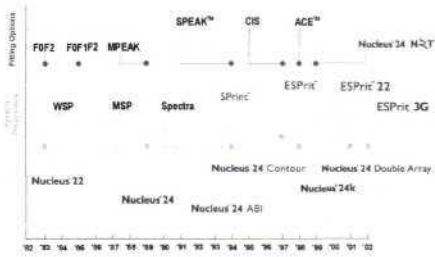
Evolution of Cochlear Implant Technology

- In 2001, MedEL's Combi 40+ cochlear implant system received FDA approval for use in adults and children.
- This approval brought the total number of manufacturer's with FDA approved cochlear implant devices to 3. That number remains stable.

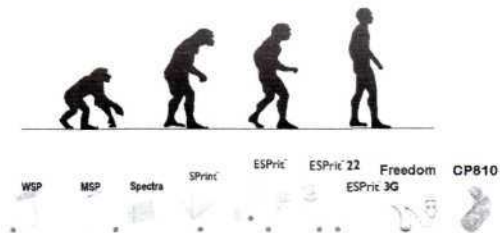
Evolution of Cochlear Implant Technology

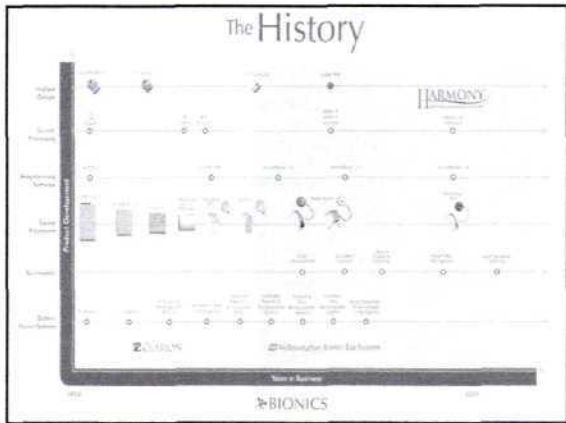
- Since the FDA first approved pediatric cochlear implantation significant advances have occurred.
 - In internal device technology
 - In speech/sound processor technology
 - In speech/sound encoding strategies

Cochlear Corporation



Cochlear Americas





MedEL

Internal Devices

- Nucleus 22
- Nucleus 24
- Nucleus 24 Contour
- Nucleus 24 Contour Advance
- Nucleus Freedom
- Nucleus 5
- Claron 1.2
- Claron S-Series
- Claron HiFocus
- Claron CII
- 90K
- Combi 40+
- Sonata

In the past 20 years, there have been more than a dozen internal devices associated with multichannel cochlear implant systems. All are still in use by recipients.

Speech/Sound Processors

- MSP
- SPECTRA
- SPnat
- ESPnat
- ESPnat 22
- ESPnat 3G
- Freedom
- Nucleus 5 (CP810)
- Clarion L2
- S-series
- PSP
- Platinum HTE
- Auro
- Harmony
- CISPro+
- Tempo+
- Opus
- Opus 2

In the past 20 years, there have been at least 18 sound processors associated with multichannel cochlear implant systems. Approximately 1/2 are still in use by recipients.

Speech/Sound Processing Strategies

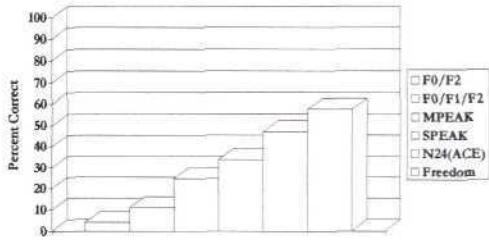
- MPEAK
- SPEAK
- CIS (3 versions)
- CA
- ACE
- SAS
- PPS
- CIS+
- N of M
- HiRes S
- HiRes P
- ACE RE
- FineTuning
- HiRes120 - S
- HiRes 120 - P

In the past 20 years, there have been more than 15 speech/sound processing strategies associated with multichannel cochlear implant systems. At least a dozen are still in use by recipients.

Changing Expectations

- Initial hopes for cochlear implants were that they would serve as an aid to speech reading
- At first, open-set speech recognition was achieved principally by “star” patients
- Now, open-set speech recognition is not just hoped for by a few, but anticipated by many, if not most recipients

CNC Scores Over Time



Changing Expectations

- Improvements in recipient performance have necessitated the development of newer and more difficult speech perception assessments
 - Shift from CID sentences to more difficult materials
 - IEEE Sentences
 - BKB-Sin
 - AzBio Sentences

Changing Expectations

- Evaluation of patient performance is no longer limited to speech perception.
 - Music perception
 - Reflected in shift in terminology from "speech processor" to "sound processor"

Changing Practice Patterns

- Age of implantation
 - Fewer congenitally deaf teens
 - Lower age of implantation
- Co-existing conditions
- Bilateral implantation

Other Factors Affecting Outcomes for Pediatric CI Recipients

- Age at implantation
- Duration of Deafness
- Communication methodology
- Etiology of Hearing Loss
- Philosophy of the implant team
- Family support and motivation

Age of Implantation

- Initially 2 years of age
- Lowered to 18 months of age in 1998
- Lowered again - to 12 months - in 2000
- Captures more of the critical period for language development
- Some co-existing conditions not evident at the time of implantation

Communication Methodology

- CID Study shows stronger auditory skills with oral communication methodology
- May influence device bonding
- Language vs. speech

Etiology of Hearing Loss

- Meningitis
- Cytomegalovirus (CMV)
- Mondini malformation, cochlear dysplasia, Pendred Syndrome

- Connexin 26

Philosophy of Implant Team

- Moog framework
- Communication Methodology preferences
- Scheduling demands
- Team structure and resources
- Experience and longevity

Family Support and Motivation

- Internal or external locus of control
- Available resources
 - Financial
 - Educational
 - Support network
- Other stressors

Efficacy vs. Effectiveness

- Treatment efficacy deals with how well a treatment can work under ideal or laboratory conditions.
- Treatment effectiveness deals with how well a treatment works for patients under real world conditions.

Cox (2004)
Hearing Journal, Vol. 57, No. 8

In a 1999 study of trends in educational placement for pediatric cochlear implant recipients, Francis, Koch, Wyatt, and Niparko reported that 75% of study participants who had more than 4 years of implant experience were enrolled in a full-time mainstream school placement.

Archives of Otolaryngology – Head and Neck Surgery
1999; 125: 499 - 505

Benchmark is Normal Hearing Peers

- Yoshinaga-Itano

Management Strategies

- Explore expectations
- Know the recipient's history
- Make data driven decisions
 - Speech perception
 - Device Programming
 - Language skills
 - Cognitive abilities
 - Academic performance

Management Strategies

- Speech Perception data serve as the cornerstone for decision making
 - Scores reflect input the child is receiving
 - Examine current level of performance
 - Explore rate of progress

Management Strategies

■ Speech Perception Battery

- CDaCI study
 - IT-MAIS
 - MAIS
 - ESP
 - PSI
 - MLNT
 - LNT
 - PBK
 - HINT-C

Management Strategies

■ Speech Perception Battery

- Adult Battery
 - CNC Words
 - HINT
- Other Measures
 - NU-CHIPS
 - WIPI
 - NU-6 Word Lists
 - BKB-SIN
 - IEEE Sentences
 - AzBIO Sentences

Management Strategies

■ Speech Perception Categories

- Category 0 - No Detection of Speech at 65 dB HL
- Category 1 - Detection of Speech at 65 dB HL with NO Pattern Perception
- Category 2 - Pattern Perception
- Category 3 - Beginning Word Identification
- Category 4 - Intermediate Word Identification
- Category 5 - Consistent Word Identification and Beginning Open Set Speech Recognition (<50%)
- Category 6 - Consistent Open Set Speech Recognition (> 50%)

Management Strategies

- Applying the data
 - Importance of 30% open set single word speech recognition skills

Management Strategies

- Benchmarks
 - Pattern Perception
 - Open Set Speech Recognition
 - < 30%
 - 30% – 50%
 - >50%

Management Strategies

- Device Programming
 - Deactivated electrodes
 - Restricted dynamic range
 - Evidence of difficulty in establishing loudness growth
 - Fixed dynamic range
 - Fixed C or M levels
 - Marked shifts from default stimulation parameters
 - Higher than average stimulation levels
 - Objective measures
 - Second opinion

Management Strategies

- Language Skills
 - Current Performance
 - Rate of progress
 - Comparison with normal hearing peers

Management Strategies

- Cognitive Abilities
 - IQ
 - ADD
 - LD
- Academic Performance
 - Current skills
 - Rate of progress
 - Comparison with normal hearing peers

Management Strategies

- Focus on what can be controlled
- Revisit expectations
 - Parent assessment of recipients strengths and weaknesses
 - Recipient assessment of strengths and weaknesses
- Remember the implant is one of many tools

Case Study 1

- Details of Case Studies will not be posted with on-line handouts. While only de-identified patient data be used in the presentation, not including Case Study details further protects patient confidentiality.

Case Study 2

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Case Study 3

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