A Quick Look Back and a Charge Going Forward

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A Look Back...

1935
Baby can amuse himself with toys in a play pen
Still cuff to prevent thumb sucking
Give the baby a coat of summer tan
Ewing & Ewing, 1947

“In the Education Act of 1944 both the rights and responsibilities of parents are clearly recognized. If, when a child becomes two years old, they suspect that he is handicapped by deafness or partial deafness, they may apply to their Local Education Authority, which must arrange for a medical examination...Diagnosis, we would urge, should be made by an otologist...”

Opportunity and the Deaf Child, University of London Press
Ewing & Ewing, 1958

“...To ensure that all children whose hearing is defective have the best possible chance of remedial treatment, the writers are convinced that all babies should be given screening tests of hearing, by the ninth to twelfth month.”

New Opportunities for Deaf Children, Charles C. Thomas: Springfield
1960s: Apitron
History of Neonatology

• 1961
  – Dr. Mildred T. Stahlman founds Division of Neonatology at Vanderbilt University Hospital, developing the first respirator for infants with damaged lungs.

• 1962
  – Dr. Mildred T. Stahlman founds nation’s first Neonatal Intensive Care Unit at Vanderbilt University Hospital.
The stimulus was a 2500-4500 Hz band noise at a level of 92 dBA. Loudspeaker placed at foot of baby’s crib. Records for 24 hours with 36 trials presented.

Simmons FB, Russ FW. Automated newborn hearing screening, the Crib-o-gram. Arch Otolaryngol 1974;1003:1-7
Auditory Response Cradle – 1980s

• Measured trunk and limb movements, startle responses of the head, and infant respiratory pattern with the combination of a pressure-sensitive mattress and transducers.
• Used a high-pass noise (2600 to 4500 Hz) of 85 dB SPL.
• The average time for response analysis was 2 to 10 minutes.
1967  Recommendations from the National Conference on Education of the Deaf

- High-risk register to facilitate identification
- Public information campaign
- Testing of infants and children 5-12 months of age should be investigated
What Percentage of Hearing Impaired Children were High Risk as Infants?

- Feinmesser et al. (1982): 49%
- Pappas & Schaibly (1984): 54%
- Elssmann et al. (1987): 48%
- Watkin et al. (1991): 43%
- Mauk et al. (1991): 50%
- Mehl & Thomson (1998): 50%

From: K. White, Sound Foundations Conference 2010
Age in Months at Which Permanent Hearing Loss Was Diagnosed

- Coplan (1987): 35 months
- Elssman et al. (1987): 19 months
- Gustason (1987): 30 months
- Meadow-Orlans (1987): 30 months
- Stein et al. (1990): 31 months
- Mace et al. (1991): 25 months
- Johnson et al. (1997): 3 months
- Vohr et al. (1998): 3 months
- Harrison and Roush (2003): 4 months
- Massachusetts (2004): 2 months

January 30, 1987

- 8 year-old with severe hearing loss
- Parents suspected at 13 months
- Fit with hearing aids at approximately 2 years
- Cochlear implants not available
Alex: October 2008

• 6 year-old male with severe-to-profound hearing loss
• Failed newborn hearing screening but never went for follow up until age 2 years
• Fit with hearing aids at age 2 years
• Intervention at age 3 years
• Cochlear implant at age 4 years
Ellie: 2010

- Age 7 years
- Passed newborn screening
- Diagnosed, fitted with bilateral hearing aids, and enrolled in early intervention at 10 months
- Received first cochlear implant at age 14 months, second cochlear implant at age 4-5 years
What took us from

There to here?

Newborn screening  Trained personnel  Improved Technology  Timely, appropriate interventions

How does this happen?
Components of an effective program:

- Medical Home
- Community support
- Personnel preparation
- Newborn hearing screening
- Diagnosis
- Early Intervention
- Monitoring
- Program evaluation
- Data management
- Quality Assurance
- Family Support
Is this level of care available for all infants?

If not, can we make it available?
Today, 96% of newborns in the United States receive hearing screening (CDC, 2010)

But only 54% of those who do not pass are reported as having received follow up.

“Seek out opportunities for international collaboration focusing on early identification and follow up.”

(J. Gravel, 2007)
“The services should...as far as possible be geographically convenient.”

(J. Bamford, 2010)
I. A Charge Forward: Tele-Audiology
Our Challenge...
Success of telepractice has more to do with OUR attitudes than those of our patients.
Could all infants have access to high quality diagnostic and intervention services?

• 42% of states in the U.S. report some telepractice efforts
• 79% are in planning or pilot stages; only 4% are fully implemented

2010 NCHAM EHDI survey
Remote Assessment

electrodes

earphones
Remote Intervention
Remote Consultation/Demonstration
II. A Charge Forward: New Considerations in Screening?

Screening for etiology?

- Screening for cytomegalovirus
- Screening expectant mothers for the mitochondrial gene MTRNR1
- Molecular genetic tests to detect cases of hearing loss not present at birth
III. A Charge Forward: Working Toward Prevention
– Not just Treatment – of Hearing Loss?

• Childhood cancer survival rates are ~80% in developed countries
• Platinum chemotherapy drugs result in ototoxicity in 60% of pediatric patients
• We will have a role in determining alternative approaches
  – Protective agents (chemoprotectants)
  – Alternative dosages
IV. A Charge Forward: Personalized Intervention

Are we ready to expand our personalized treatment of infants and children with hearing loss?
We currently individualize hearing technology fittings by the use of the RECD.

But what else can we do?
Develop clinical tests of temporal processing to aid in predicting which children with ANSD are hearing aid versus cochlear implant candidates?
Can we improve the individualized care we provide to our patients based on individual child and family factors?

If so, maybe we can get more than 33% of children to wear their hearing aids >8 hours a day!
Can **all** children get here?

- Newborn screening
- Trained personnel
- Improved Technology
- Timely, appropriate interventions
The early years...
What’s in our future?
"The best way to predict the future is to invent it."

-Theodore Hook