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Looking to the Past for a Glimpse Into our Future

Third Latin American Pediatric Amplification Conference

October 13th, 2012

Anne Marie Tharpe

Vanderbilt University School of Medicine

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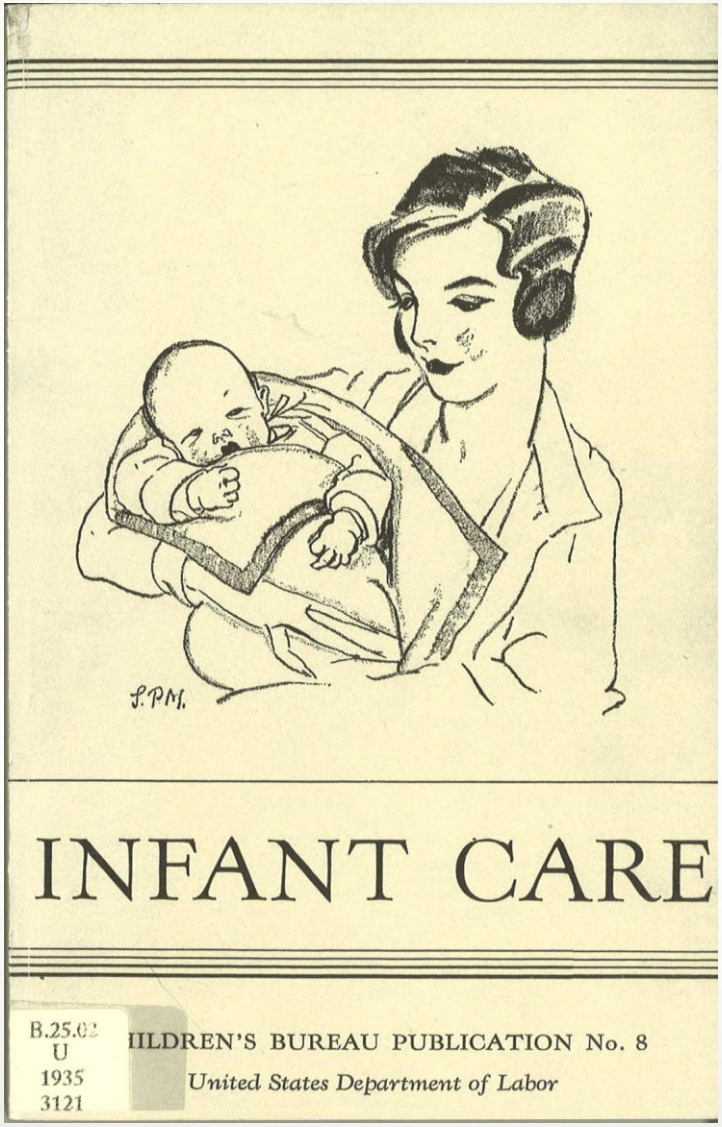
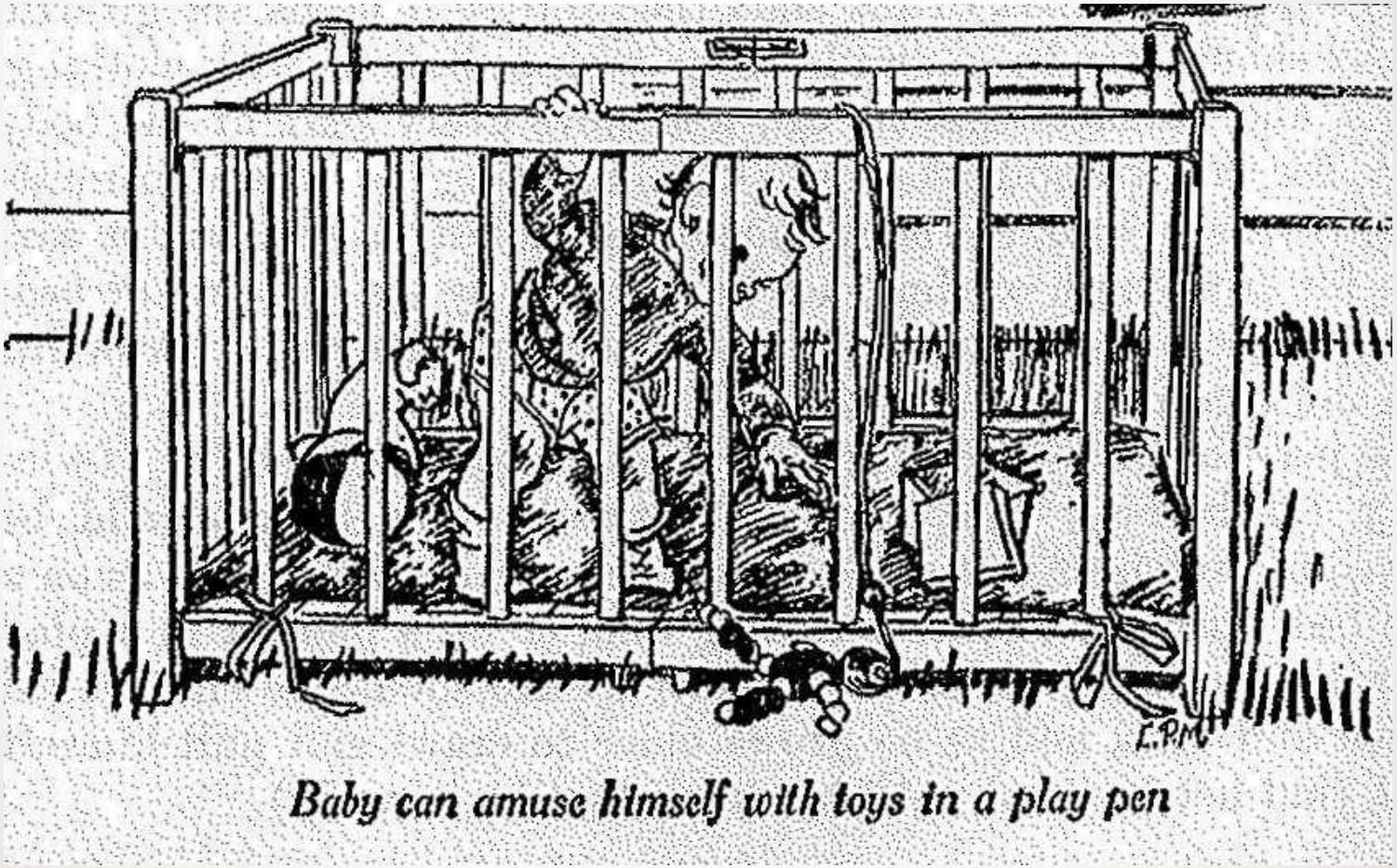
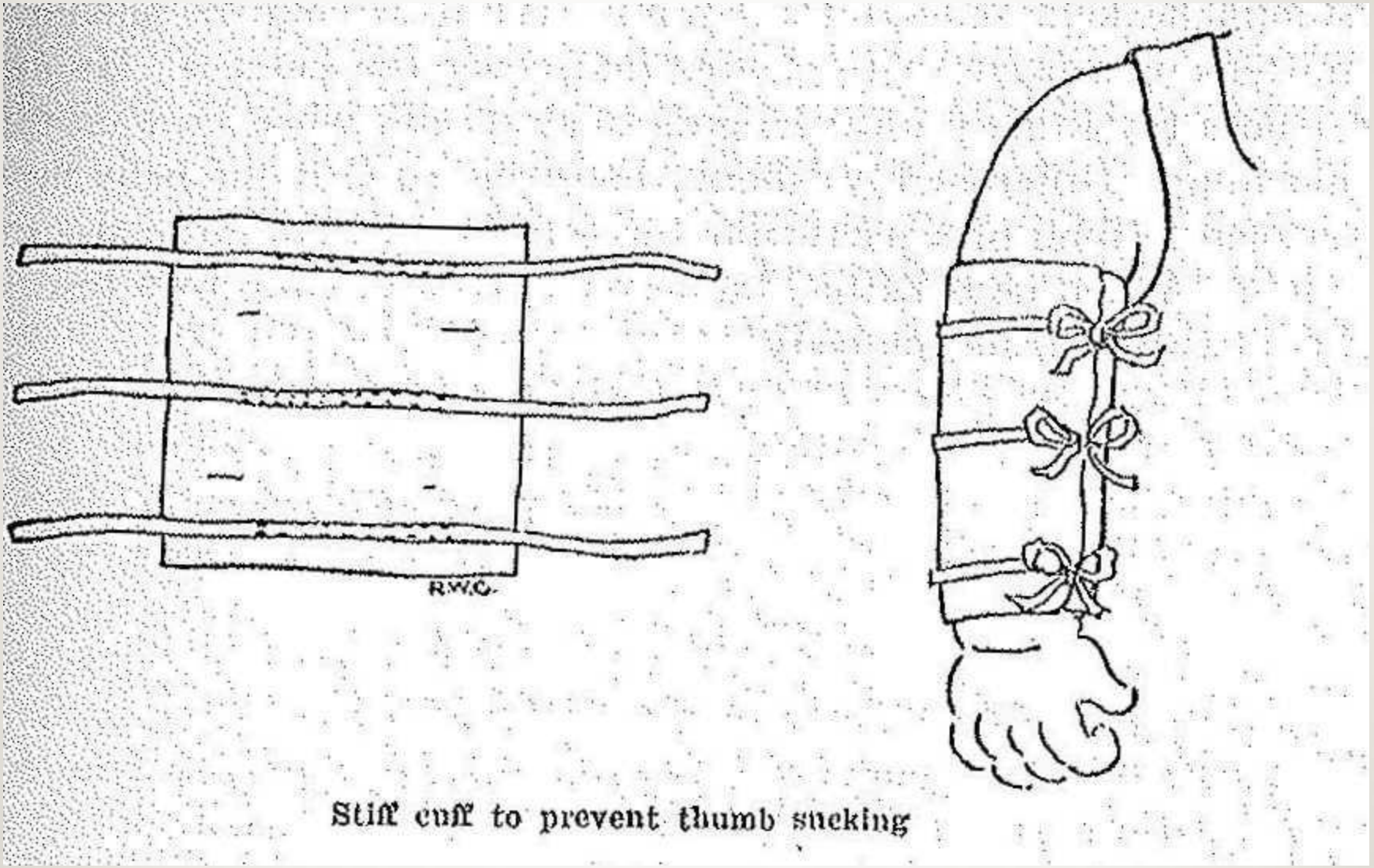
A Look Back…

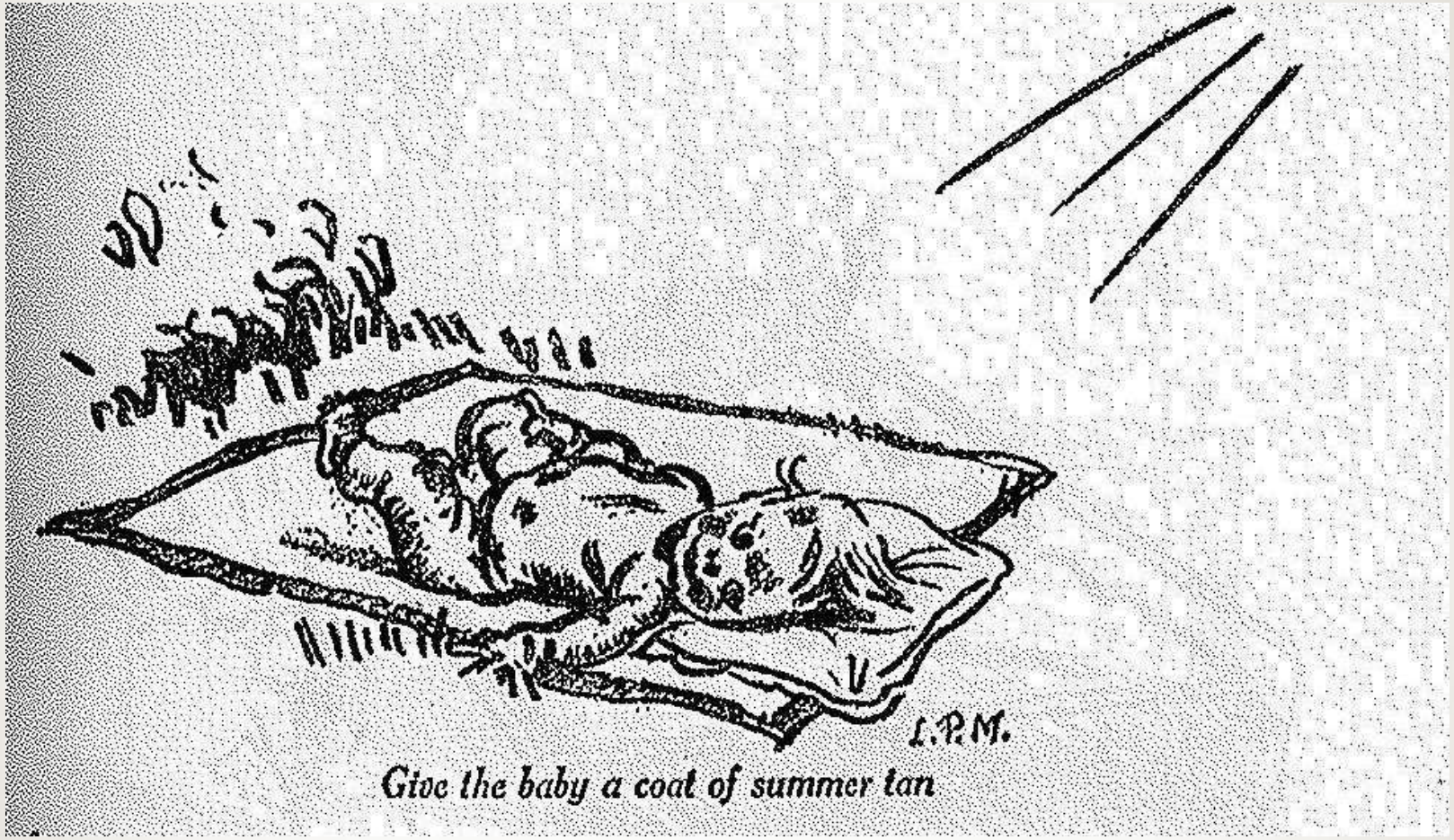




Baby can amuse himself with toys in a play pen



Stiff cuff to prevent thumb sucking


L.P.M.
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

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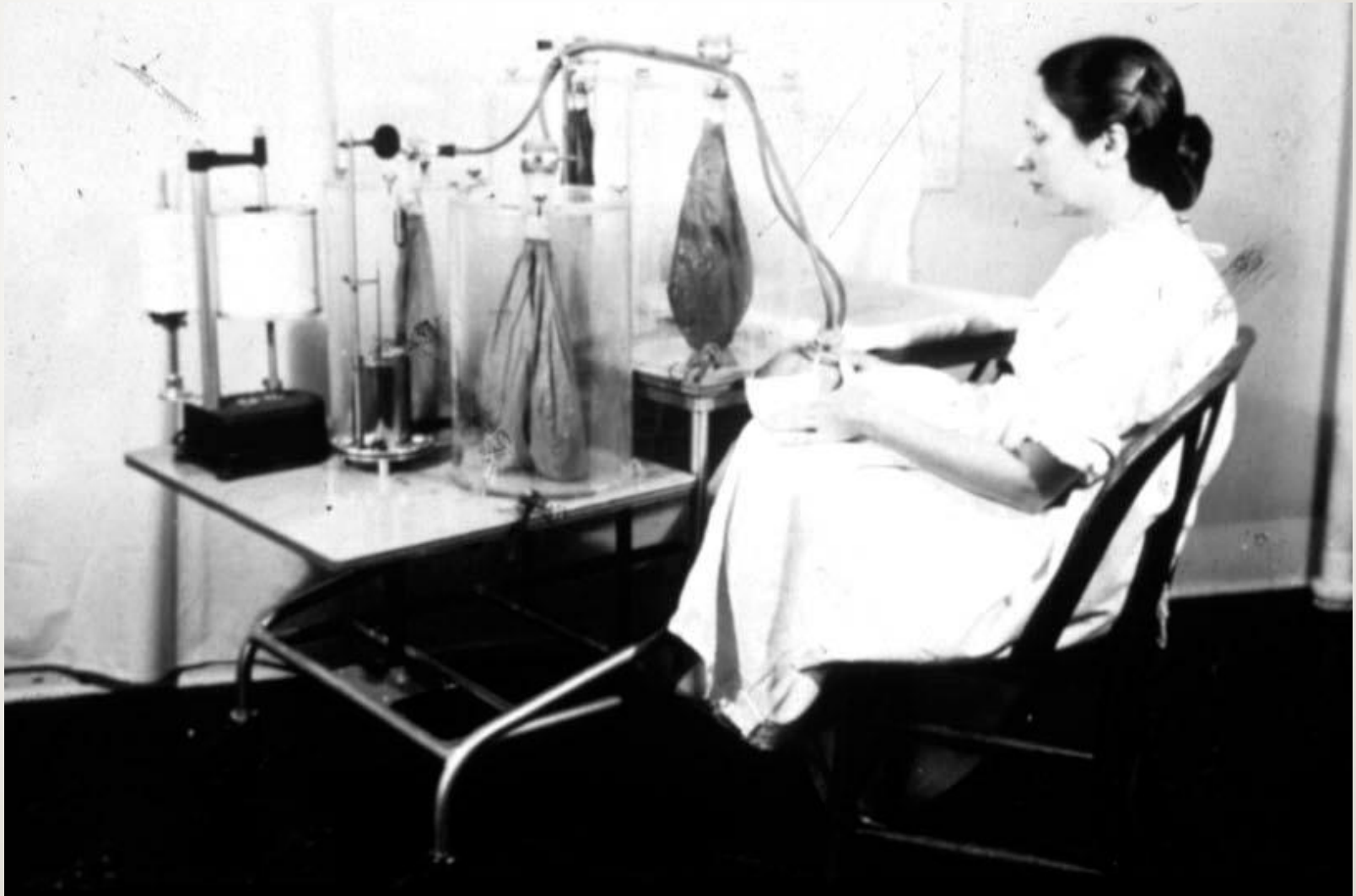
Dr. Mildred Stahlman Designs 1st Respirator for Premature Infants at Vanderbilt University



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1960s: Apitron

FIGURE 1–1. A specially designed battery-powered infant hearing screener used in the early 1960s known as the Apriton (from the auropalpebral reflex, the involuntary body movement and eye blink resulting from sudden sound onset). The examiner presented a sudden onset narrow-band noise stimulus of 90 dB SPL followed by observation for the presence or absence of reflexive infant responses.

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"…loudspeaker placed at foot of baby's crib."

Figure 1 illustrates the single channel recording apparatus used in the ICN. The motion sensitive transducer is imbedded in a silicone elastomer pad. This transducer was placed under the mattress of each baby. The output from the transducer is fed to a central control unit (Telesensory Systems, Inc. Model G1-A) and is recorded on a strip chart. Typically the gain of the system was adjusted for each baby so that quiet respiration yielded tracings with approximate 2mm peak-to-peak amplitudes. Interstimulus intervals were typically set at 40 min via a timing circuit housed within the control unit. The final component of the system is a loudspeaker that was placed at the foot of each baby's crib. Again the stimulus was a 2500–4500 Hz [illegible] noise at a level of 92 dBA. Figure 2 illustrates the spectral characteristics [illegible] stimulus. The center frequency was 3500 Hz. The low frequency cut-off began at approximately 2500 Hz and dropped at a rate of 13 dB per octave. The high frequency cut-off began at 4500 Hz and sloped at a rate of 18 dB per octave. The stimulus intensity of 92 dBA was selected because preliminary investigations indicated that lower levels typically yielded fewer responses. This intensity was not considered harmfully loud because each stimulus was of short duration and a small number of stimuli were presented. The stimulus spectrum was centered around 3500 Hz to stimulate hearing in the upper range of frequencies important for the reception of speech and to reduce the possibility of obtaining responses from children with marked hearing losses but with significant low frequency residual hearing.

In the intensive care nursery, the single channel instrument was set up for a given infant for a 24 hour period. The [illegible] and the stimulus was calibrated to a level of 92 dBA and set just [illegible]

"…stimulus was a 2500-4500 Hz band noise at a level of 92 dBA"

"…records for 24 hours with 36 trials presented…"

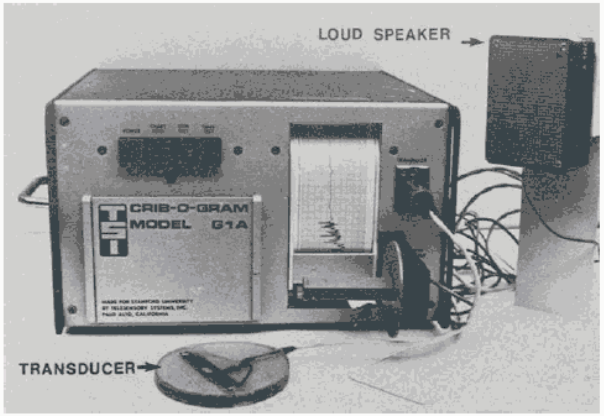
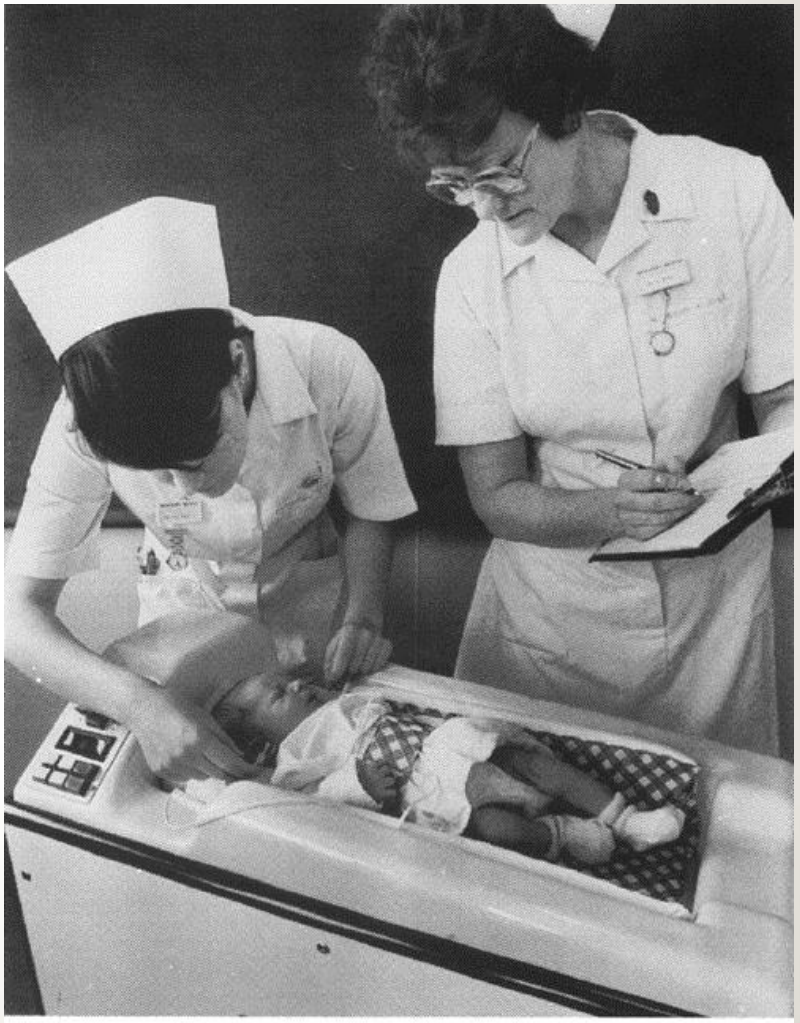


Figure 1. The Crib-O-Gram, which includes a central control unit with strip chart, a transducer, and a loudspeaker.

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.



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Arousal Test

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

Education of the Deaf in the United States: Report of the Advisory Committee on Education of the Deaf. Washington, DC: U.S. Government Printing Office.

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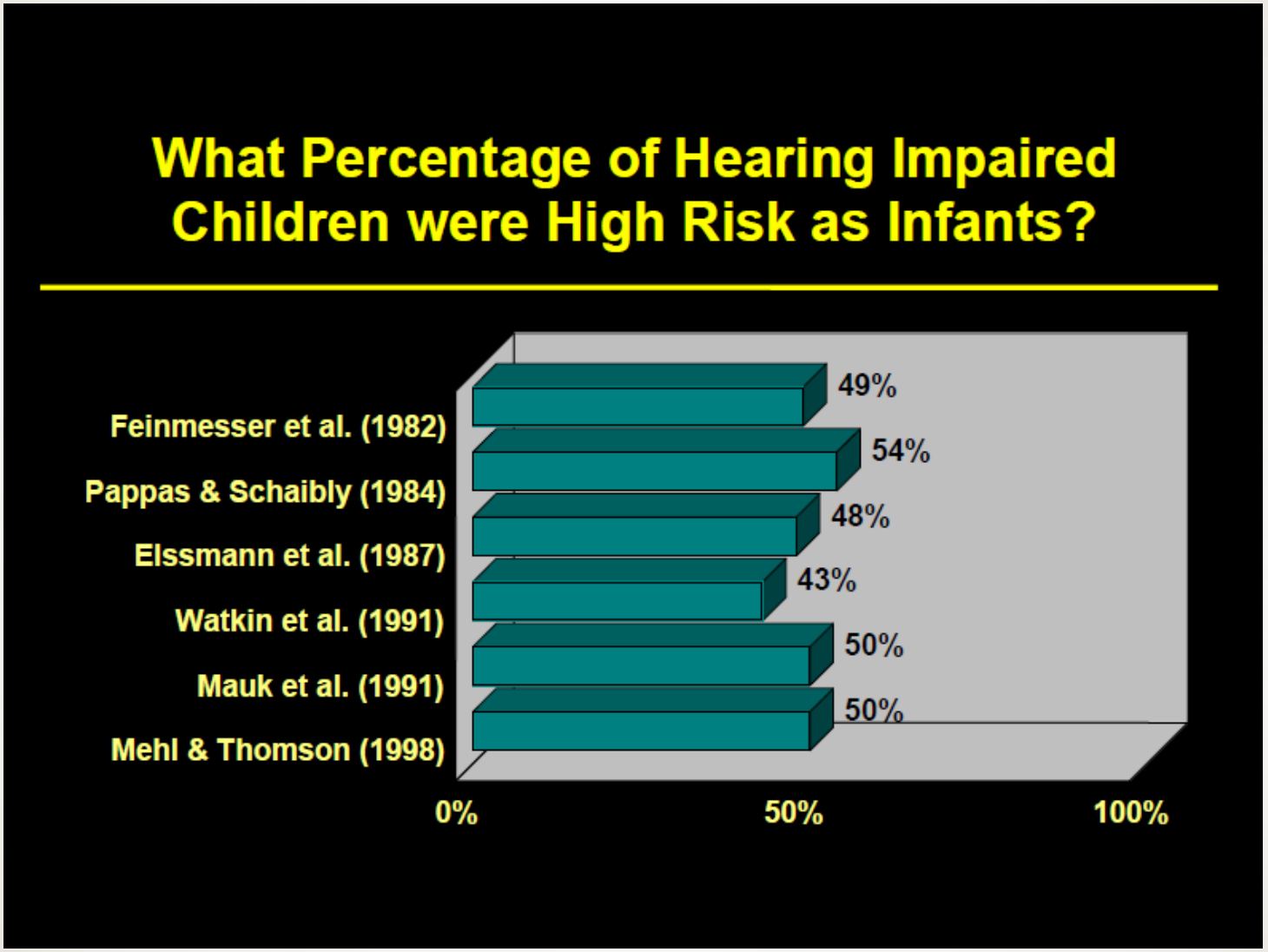
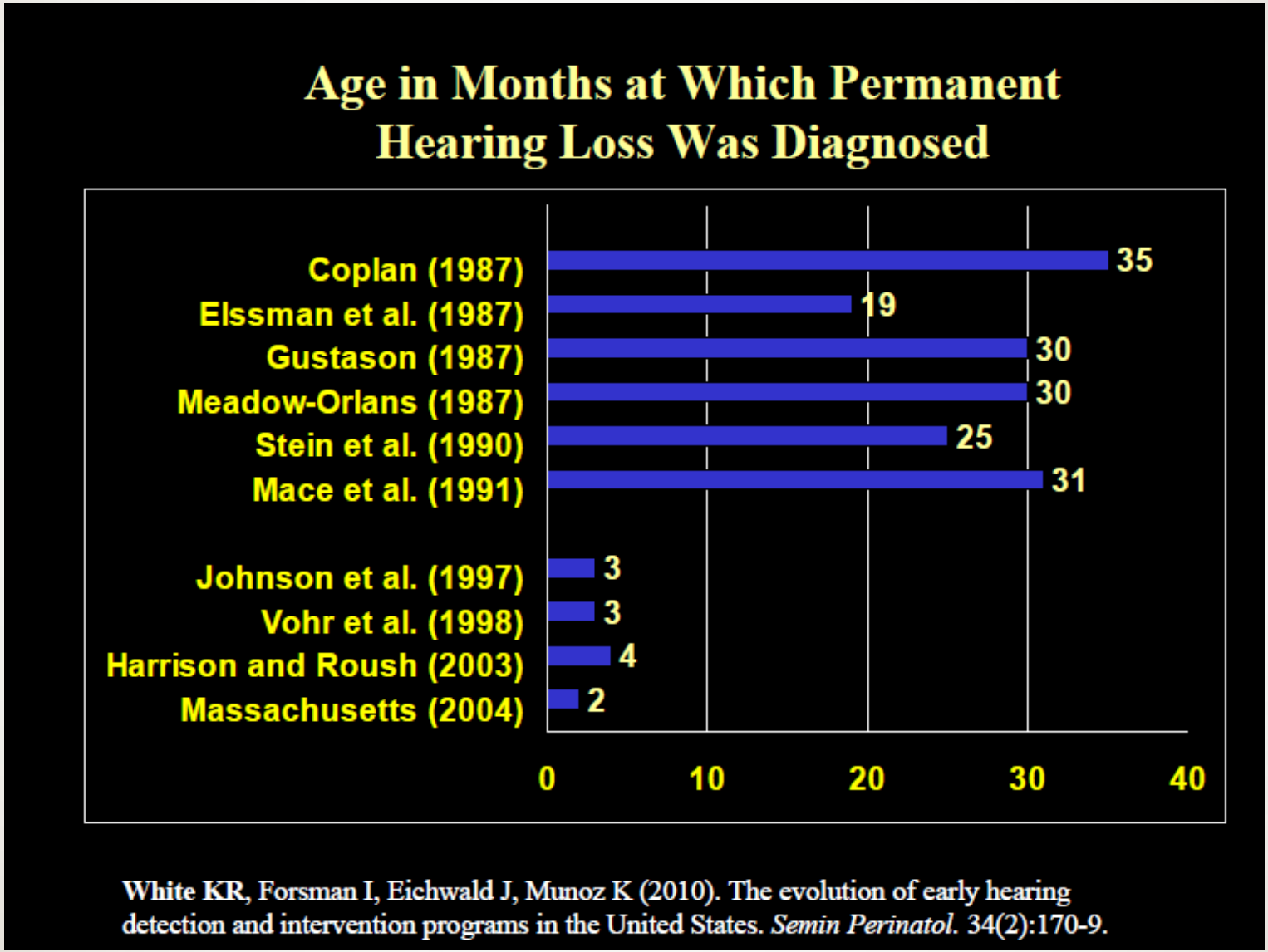


From: K. White, Sound Foundations Conference 2010



White KR, Forsman I, Eichwald J, Munoz K (2010). The evolution of early hearing detection and intervention programs in the United States. *Semin Perinatol.* 34(2):170-9.

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

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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

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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

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What took us from

There to here?

Newborn screening	Trained personnel	Technology	Timely, appropriate interventions

How does this happen?

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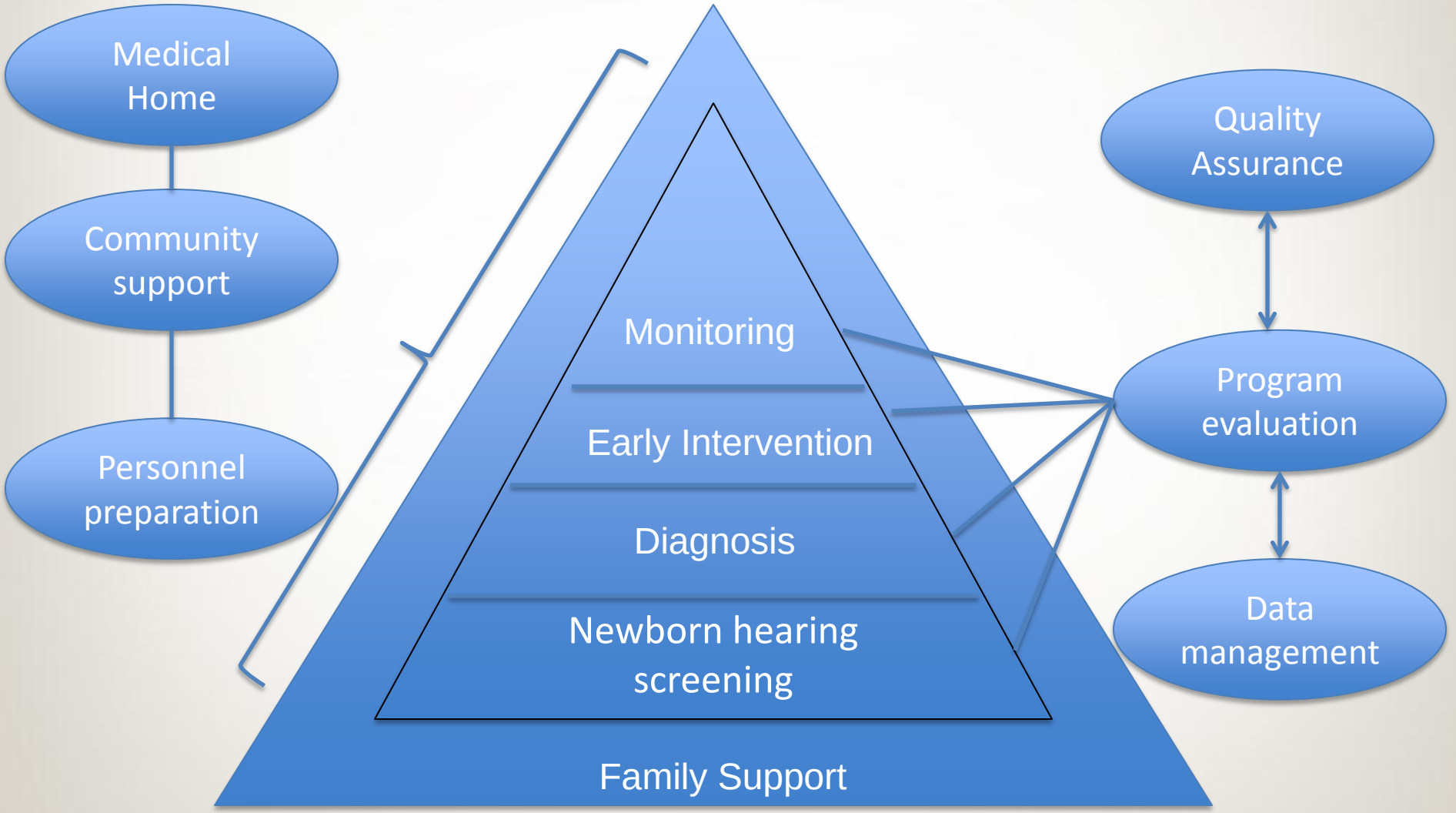
Components of an effective program:



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 (NCHAM, 2009)

<u>But</u> only 46% of those who do not pass are reported as having received follow up.

Centers for Disease Control and Prevention (2005). *Final summary of 2005 national EHDI data (Version 6)*. Retrieved from www.cdc.gov/ncbddd/ehdi/documents/Nat_EHDI_Summ_2005_Web_v6.pdf.

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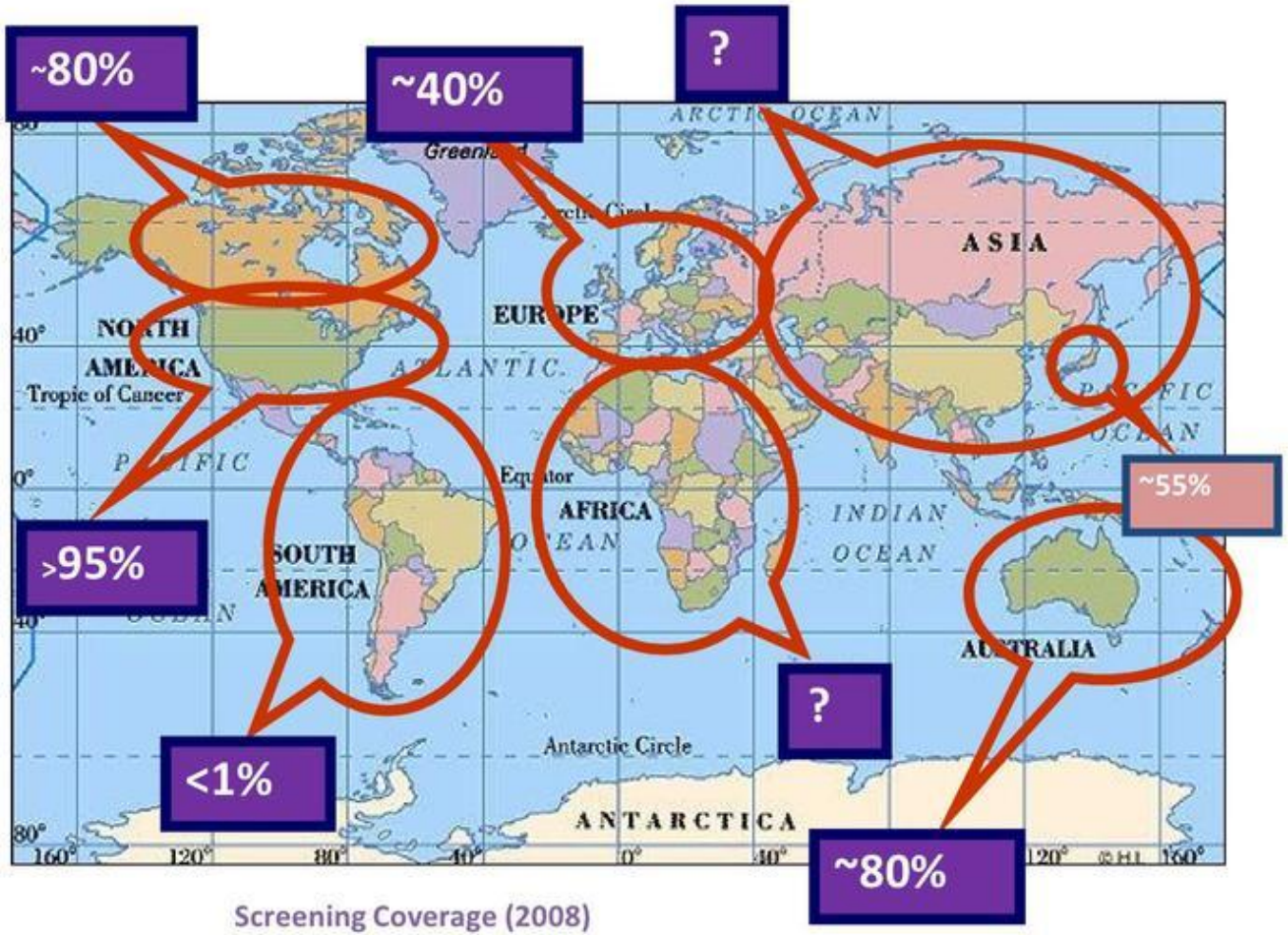
Lehnhardt 2009



Screening Coverage (2008)

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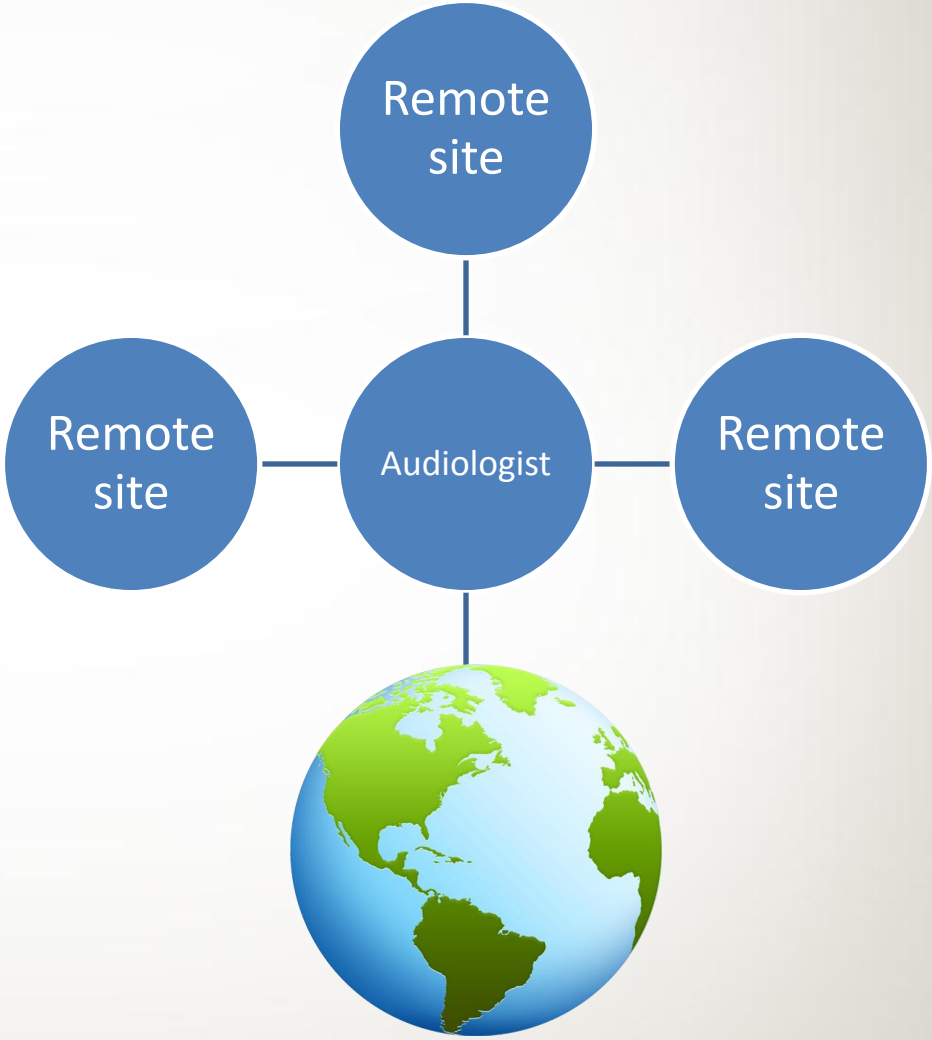
Vision for Pediatric Audiology Services:

"The services should…as far as possible be geographically convenient."

(J. Bamford, 2010)

I. A Charge Forward: Tele-Audiology



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Could all infants have access to the high quality ABR assessments described by Dr. Hyde?

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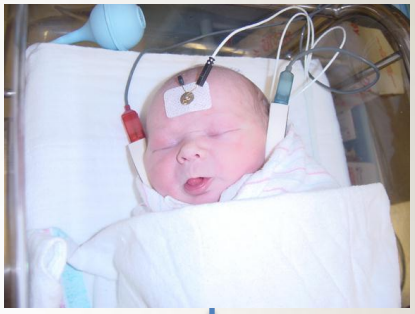
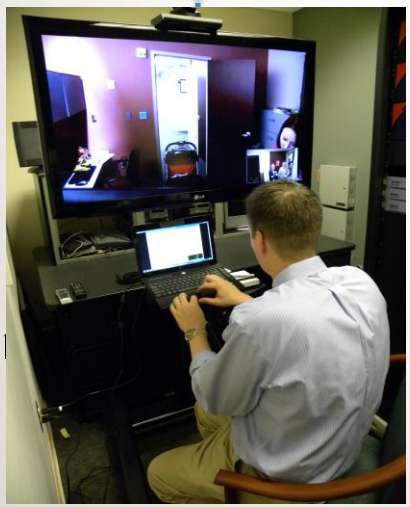
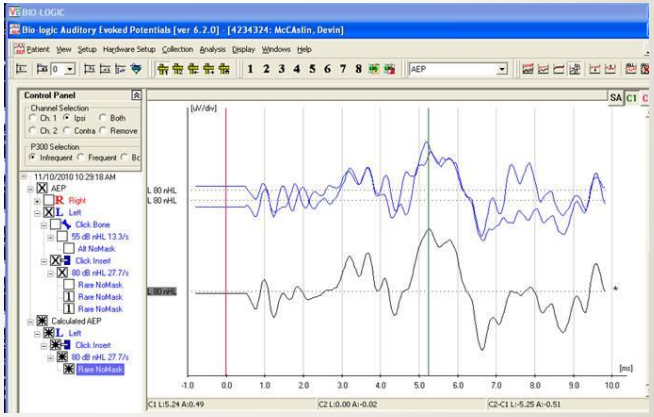
Remote Assessment

electrodes

earphones







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Can we eliminate the barriers of time and distance for families seeking optimal intervention services for their children with hearing loss?

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Can we provide remote hearing aid support of the quality described by Drs. Roush and Wolfe?

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Remote Intervention

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Visions of the Future for Children with Hearing Loss

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

(J. Gravel, 2007)

Angelina Martinez described the value that Dr. Seewald brought to her program in Brazil.

Could all audiologists receive assistance from experts like Dr. Seewald in providing the essential components of hearing instrument fittings?

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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 or associated with subclinical hearing loss

"Etiology is key for prognosis and therapy"…Dr. Cardero

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III. 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…

No longer have to treat all children with the same disorder the same way

- Cortical and psychoacoustic studies might be good predictors of functional outcomes for children with ANSD or cochlear implant candidacy (Gordon; Roush)

Such studies might allow us to determine the parameters of intervention needed for an individual child.

- Do all children need to receive therapy 3 days a week for one hour?
- Do all children need only auditory input or can we determine who needs added visual input?

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Can **all** children get here?

- Newborn screening
- Trained personnel
- Technology
- Timely, appropriate interventions

"The best way to predict the future is to invent it."

-Theodore Hook