

# Telehealth Measurement of Infant Auditory Brainstem Response Using iChirp Stimuli: Replication and Extension of Pinto et al. (2022)



UNIVERSITY OF  
SOUTH DAKOTA

Hannah Lingle, BS; Shelby Jepperson, MPH, CPH; Dr. Coral Dirks, AuD, PhD, CCC-A



## Abstract

In rural and medically underserved areas, families often face long travel distances and limited availability to see a pediatric audiologist for an evaluation after a referred or failed newborn hearing screening. These delays can postpone identification and early intervention, which is essential for language and development. This project examined whether telehealth-based auditory brainstem response (ABR) testing, using a newer type of sound called iChirp stimuli, can provide reliable results for infants who need diagnostic follow-up.

Building on Pinto et al. (2022), who showed that iChirp sounds produce clearer responses than traditional tone bursts in very young infants, this study replicated and extended those findings in a real-world telehealth setting with infants up to one year old. Local healthcare partners prepared the infant on-site, while a remote audiologist viewed the infant and the ABR recordings in real time through a secure telehealth platform. Early results show that iChirp stimuli continue to produce strong, repeatable responses even with fewer test repetitions.

These findings support the use of tele-audiology to improve access to timely diagnostic follow-up for rural families while maintaining high-quality, family-centered care.

## Background

### Why Rural Access Matters

- Many rural communities lack pediatric audiology services
- Families may travel hours for diagnostic ABR testing
- Missed or delayed follow-up increases the risk of late-identified hearing loss
- Telehealth can bring specialty access closer to home

### What are iChirp Stimuli?

- Traditional hearing tests use short “beep-like” sounds. These can be harder for a baby’s brain to respond to clearly. iChirp sounds are designed to activate the inner ear in a more coordinated way.
- Pinto et al. (2022) showed that iChirp sounds:
  - Create stronger responses
  - Produce clearer wave shapes
  - Improve the signal-to-noise ratio (the “cleanliness” of the response)
- These features make it easier for audiologists to see the infant’s hearing levels.

### Why Combine iChirps with Telehealth?

- Clearer responses help remote audiologists make confident diagnoses
- Supports efficient, accurate testing in rural clinics
- Helps states meet EHDI 1-3-6 timelines

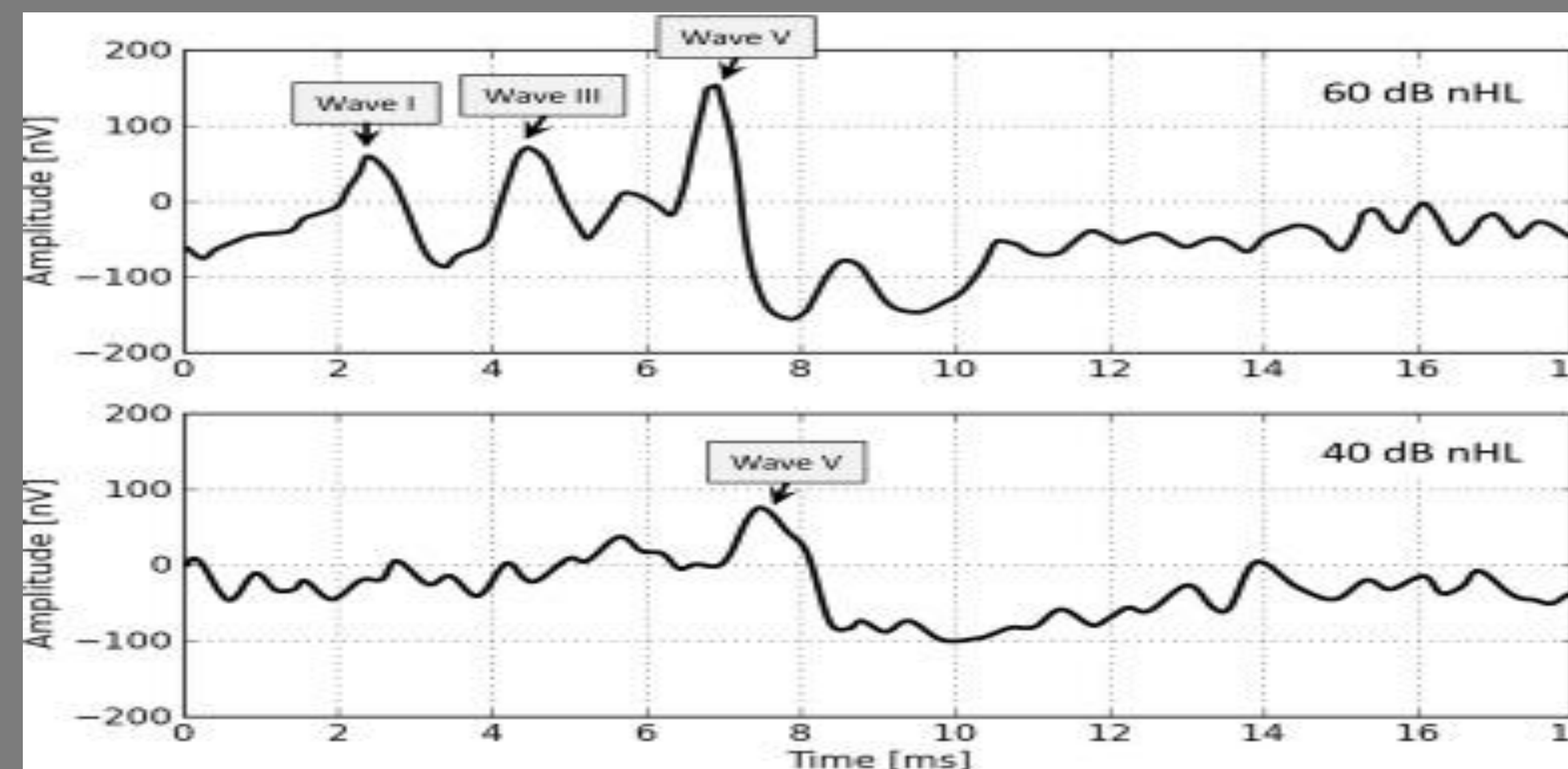


Figure 1. ABR waveform

## Materials and Methods

### Participants

- 25 infants referred after newborn hearing screening
- Test dates: January 2024 - January 2025
- Ages: 11 days to 5 months (average 8 weeks)
- Gender: 17 males, 8 females
- Referral type:
  - Left ear only: 13
  - Right ear only: 2
  - Both ears: 6

### Telehealth Process

- A local provider completed otoscopy, tympanometry, OAEs, and electrode placement
- A remote audiologist watched the baby and the ABR waveforms through a secure telehealth platform
- Both broadband and narrowband iChirp sounds were used to measure hearing levels
- The audiologist marked the infant’s hearing thresholds based on repeatable responses

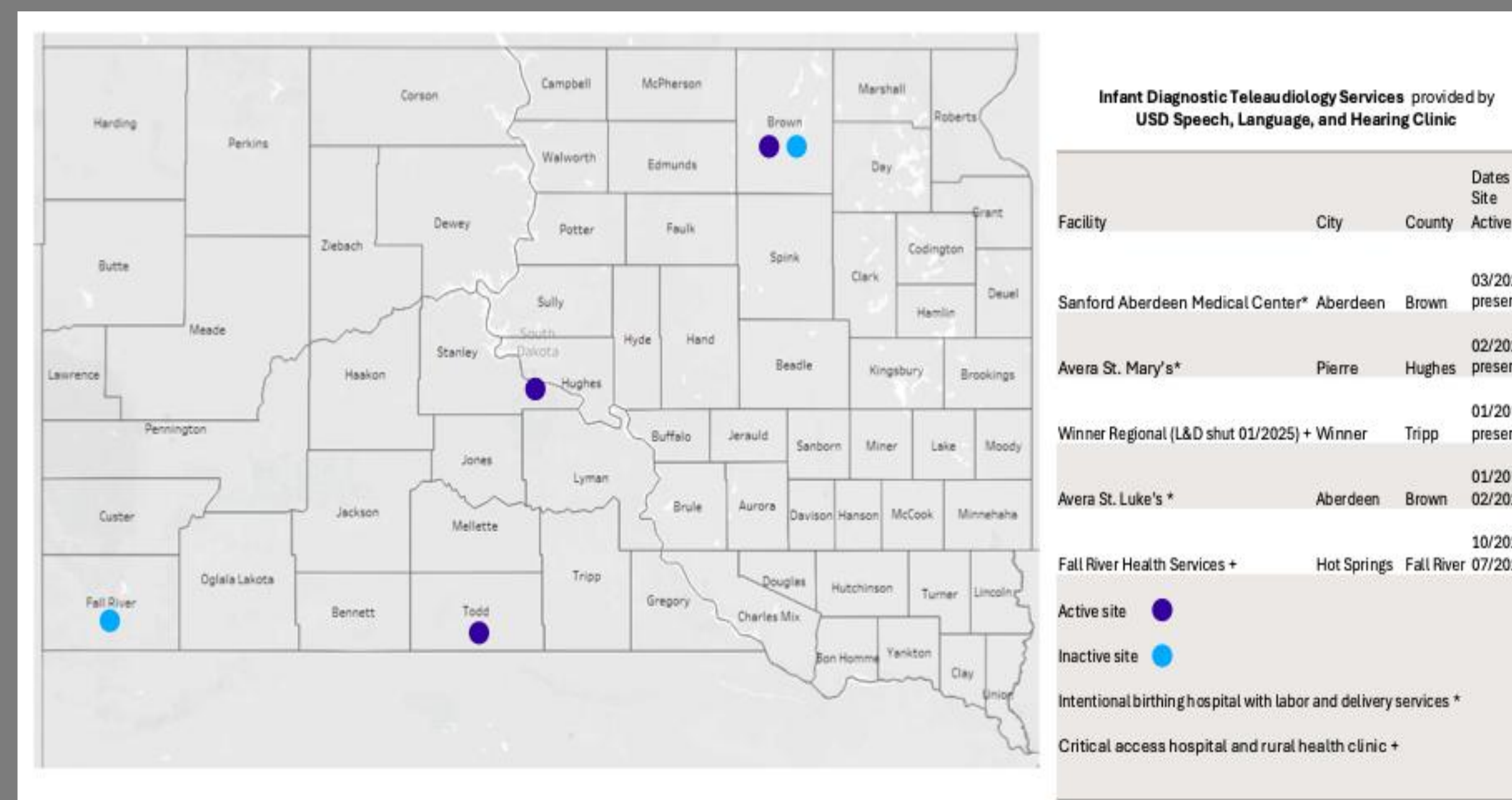


Figure 2. Map of South Dakota Infant Diagnostic Teleaudiology Sites

**Acknowledgment:** We sincerely thank the teleaudiology site teams and the families who engage with and contribute to our grant activities. We also appreciate the dedication of the students, staff, faculty, and professional partners whose contributions strengthen and sustain our efforts.

## Results

### Telehealth Feasibility

- Telehealth testing worked smoothly across multiple rural clinics
- Local and remote providers communicated easily during testing
- All 25 infants completed the full diagnostic ABR using iChirp sounds

### Response Quality

- Pinto et al. (2022) found that iChirp sounds produce stronger and clearer responses, and we saw the same pattern in our telehealth setting
- In our sample:
  - Responses were easy to see and repeat, even with fewer sweeps
  - Remote audiologist felt confident in identifying wave V
  - Testing stayed efficient

### Impact on Families

- Families received high-quality testing closer to home
- Less time spent traveling meant fewer challenges
- Timelier diagnosis supported access to early intervention sooner

## Discussion

### For Families

- Telehealth ABR using iChirp stimuli is accurate, efficient, and family-centered
- Reduces barriers for rural and underserved communities

### For EHDI Programs

- Helps states achieve 1-3-6 goals more consistently
- Expands diagnostic capacity in areas with limited audiology coverage
- Strengthens partnerships between local providers and pediatric audiologists

### Connection to Pinto et al. (2022)

- Pinto et al. found that iChirp sounds “promoted greater amplitudes and better wave morphology...providing greater efficiency in the investigation of auditory thresholds.” Our results show that these benefits also hold true in a telehealth model, supporting wider use of iChirp stimuli in infant hearing testing

## Conclusions

- iChirp stimuli produce strong, reliable ABR responses in telehealth settings
- Telehealth ABR is a practical and effective option for rural and medically underserved areas
- This model can reduce disparities in access to hearing care
- Expanding teleaudiology may help more infants receive timely diagnosis and early support

## References

- Pinto, J. D., Forneck, L. L. M., Ferreira, L., Cargnelutti, M., Cöser, P. L., & Biaggio, E. P. V. (2022). Auditory brainstem response with the iChirp stimuli in the infant’s audiological diagnosis. *International Journal of Pediatric Otorhinolaryngology*, 154, 111042. <https://doi.org/10.1016/j.ijporl.2022.111042>
- Cebulla, M., Lurz, H., & Shehata-Dieler, W. (2014). Evaluation of waveform, latency and amplitude values of chirp ABR in newborns [Figure 1]. *International Journal of Pediatric Otorhinolaryngology*, 78(4), 631–636. <https://doi.org/10.1016/j.ijporl.2014.01.020>

**Disclosure:** The Health Resources and Services Administration (HRSA), Department of Health and Human Services (HHS), provided financial support for this work. The contents are those of the author(s), they may not reflect the policies of HRSA, HHS, or the U.S. Government. (02/2026)