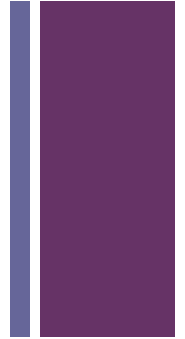


# Success and Challenges to Providing Timely Infant Diagnostic Hearing Assessments

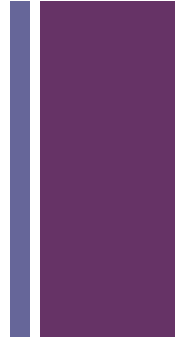
Karen Munoz, Ed.D., CCC-A  
Lauri Nelson, Ph.D  
Utah State University  
EHDI Conference 2010 Chicago, IL

# + Acknowledgements



- Irene Forsman, Maternal and Child Health Bureau
- Pat Rousch, University of North Carolina Chapel Hill
- Natalie Goldgewicht, AuD Student (USU)

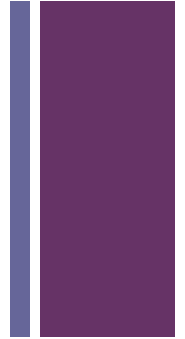
# + Early Diagnosis of Hearing Loss



- The objective of Early Hearing Detection and Intervention (EHDI) programs is to provide an opportunity for early identification and intervention for babies born with hearing loss.
  - Screening: complete before 1 month of age
  - Diagnostic hearing test: complete before 3 months of age
  - Hearing aid fitting: within one month of diagnosis
  - Intervention: begin before 6 months of age

**Intervention cannot begin until a diagnosis has been confirmed with appropriate detail to guide intervention decisions**

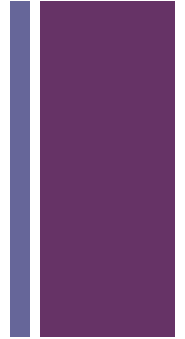
# + Purpose of the Survey



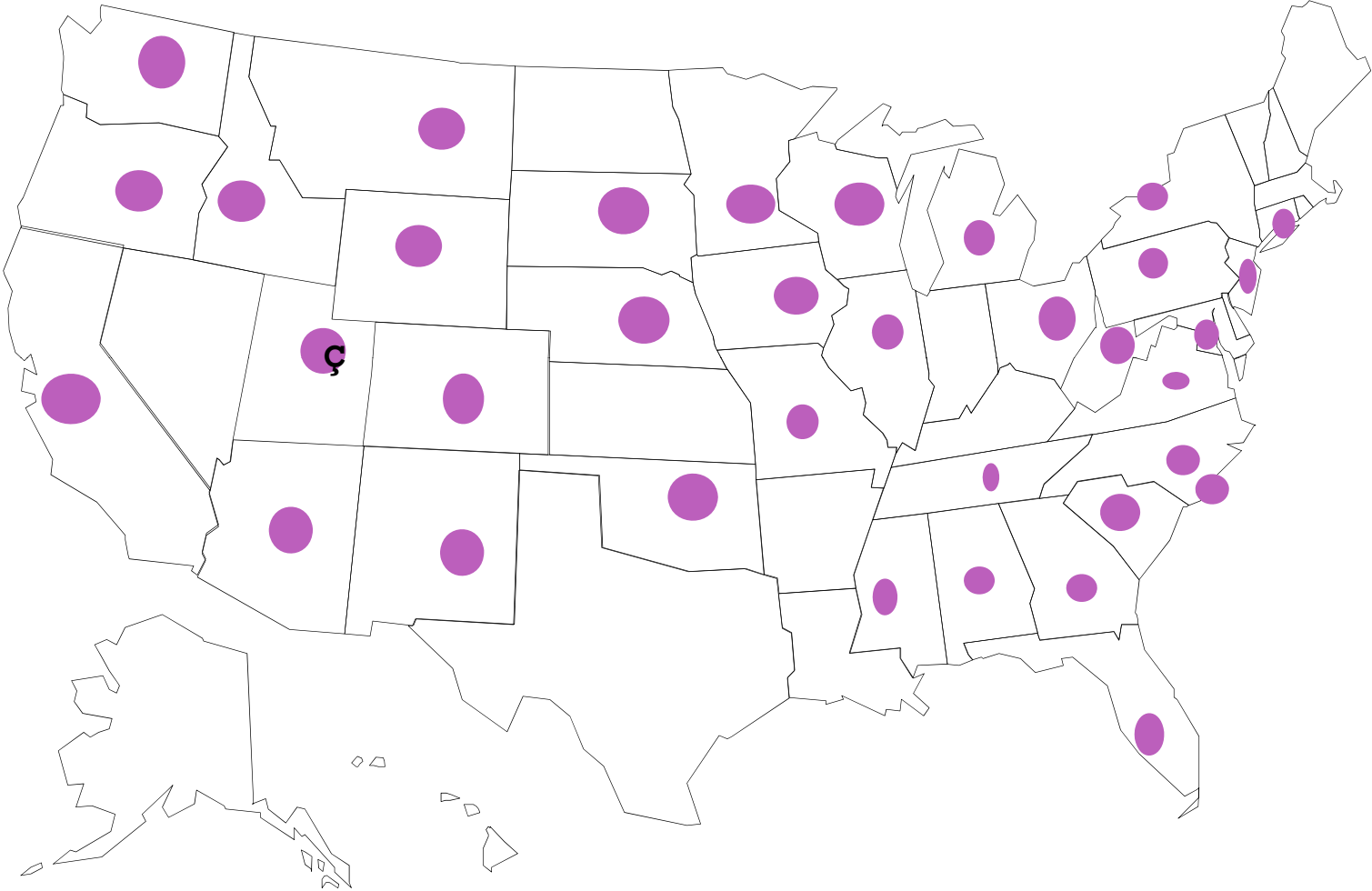
The survey was designed to ask the following questions:

- What are practice patterns for infant diagnostic testing?
- How well are audiologists meeting the diagnostic testing needs of babies that fail their newborn hearing screening?
- What are the challenges to providing timely diagnostic testing?

# + Participants



- State EHDI coordinators were invited to mail surveys to the infant diagnostic hearing centers in their state
  - 29 states chose to participate
    - Paper surveys were mailed to each center (August-Nov 2009)
    - Two reminder postcards were mailed to each center with an option to fill out the survey online
  
- One survey was completed per diagnostic center
  - 1091 surveys were mailed
  - 356 surveys completed
  - Return rate:
    - 33%

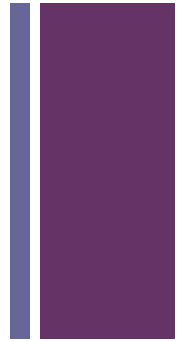


| STATE | MAILED | COMPLETED | RETURN RATE |
|-------|--------|-----------|-------------|
| AL    | 61     | 11        | 18%         |
| AZ    | 10     | 8         | 80%         |
| CA    | 70     | 32        | 46%         |
| CO    | 42     | 8         | 20%         |
| CT    | 9      | 4         | 44%         |
| DC    | 3      | 6         | 100%        |
| FL    | 87     | 21        | 27%         |
| GA    | *      | 1         | N/A         |
| IA    | 12     | 5         | 42%         |
| IL    | 108    | 27        | 25%         |
| MD    | 30     | 15        | 50%         |
| MI    | 21     | 11        | 52%         |
| MN    | 23     | 13        | 57%         |
| MO    | 30     | 12        | 40%         |
| MS    | 17     | 7         | 41%         |
| MT    | *      | 1         | N/A         |
| NC    | 18     | 8         | 47%         |
| NE    | 28     | 15        | 54%         |
| NJ    | 26     | 16        | 61%         |
| NM    | 5      | 1         | 20%         |
| NY    | 106    | 16        | 15%         |
| OH    | 20     | 17        | 85%         |
| OK    | 21     | 11        | 52%         |
| OR    | *      | 3         | N/A         |
| PA    | *      | 4         | N/A         |
| PW    | *      | 1         | N/A         |
| SC    | 46     | 7         | 16%         |
| SD    | *      | 1         | N/A         |
| TN    | 40     | 10        | 25%         |
| UT    | 19     | 13        | 72%         |
| VA    | 56     | 12        | 21%         |
| WA    | 67     | 16        | 24%         |
| WI    | 42     | 9         | 21%         |
| WV    | 34     | 6         | 18%         |
| WY    | 40     | 6         | 15%         |

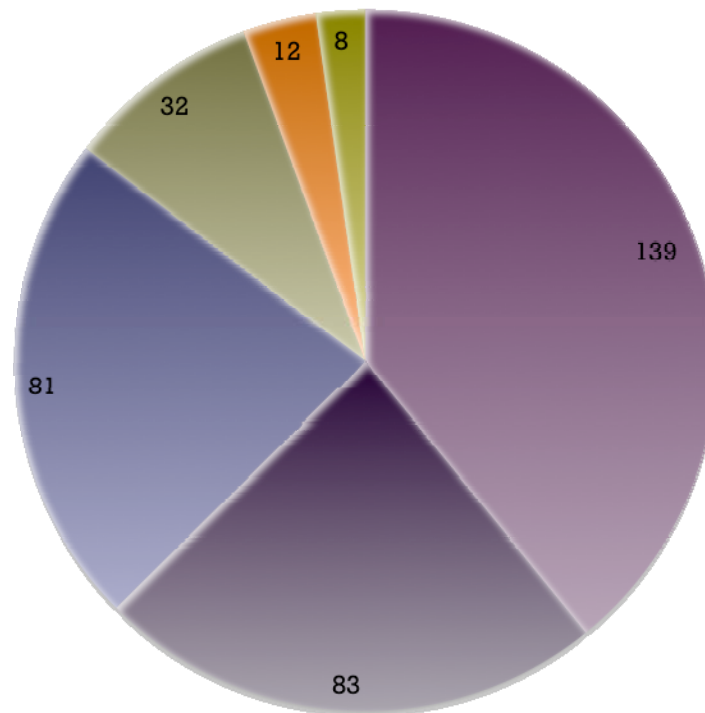


# + Type of Facility

(n = 356)



**Type of Testing Facility**

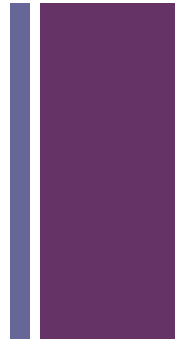


- Hospital (139)
- Medical Clinic (83)
- Private Practice (81)
- Other (32)
- University Clinic (12)
- Public School (8)

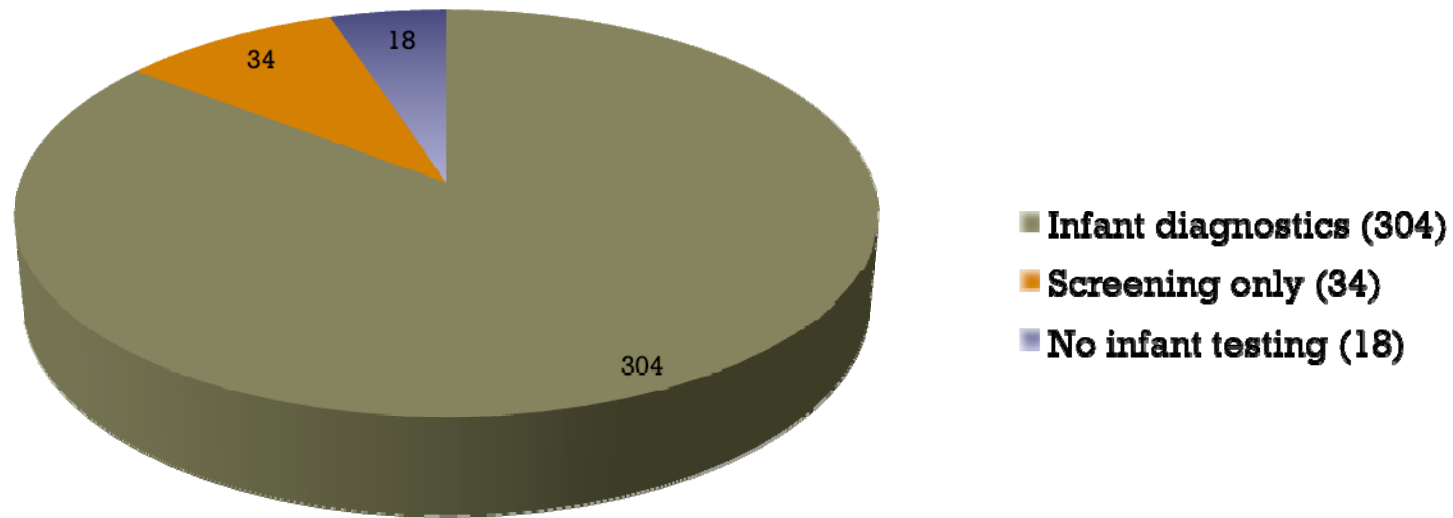


# + Type of Testing Provided

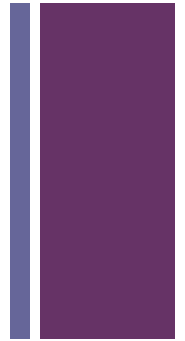
(n = 356)



**Type of Testing Provided**



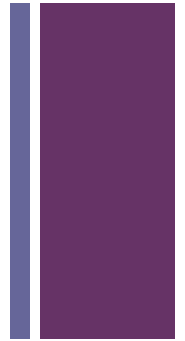
# + Identification of Pediatric Testing Facilities



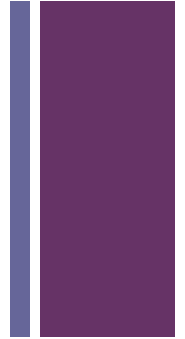
- EHDI Coordinators mailed surveys to pediatric testing facilities
  - 15% do not provide infant diagnostic testing services
- Implications:
  - Inconsistent reporting to EHDI coordinators
    - Difficult to accurately identify pediatric testing facilities that provide comprehensive testing
  - Physician/Parent requests for a list of pediatric testing facilities in area may be inaccurate and/or incomplete
    - Delays in obtaining testing may occur

# + Recommended infant diagnostic test battery (Joint Committee in Infant Hearing [JCIH], 2007)

- High frequency tympanometry
- Otoacoustic emissions
- Auditory Brainstem Response (ABR) click with ability to identify cochlear microphonic
- Frequency specific ABR with tone burst
- Bone conduction ABR
- Behavioral observation of response to sound

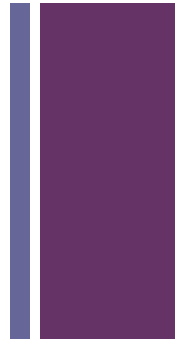


# + Test Battery Comprehensiveness Varied between Facilities (n = 265)



- **Partial Diagnostic Battery** (n = 45): 17% of facilities
  - High frequency tympanometry, OAE, click ABR
    - No frequency specific information
      - May delay definitive diagnosis
      - Lacks detail to fit hearing aids and make appropriate intervention decisions
  
- **Incomplete Diagnostic Battery** (n = 101): 38% of facilities
  - Frequency specific ABR thresholds obtained
  - Omits one or more of the following tests: high frequency tympanometry, OAE, click ABR, bone conduction ABR, a low or high frequency tone burst
    - May lead to misdiagnosis

# + Test Battery Comprehensiveness Varied between Facilities

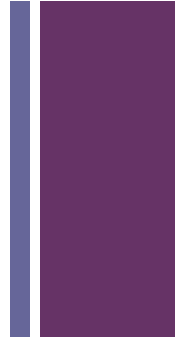


- **Comprehensive Diagnostic Battery** (n = 94): 35% of facilities
  - JCIH test battery components except one or more of the following:
    - BOA, CM, use of ASSR instead of tone burst ABR
- **JCIH Recommended Battery** (n = 13): 5% of facilities
- **Extensive Diagnostic Battery** (n = 12): 5% of facilities
  - JCIH battery plus one or more of the following: high frequency acoustic reflex, additional tone burst and/or ASSR frequencies

# + Challenges in completing testing before 3 months of age

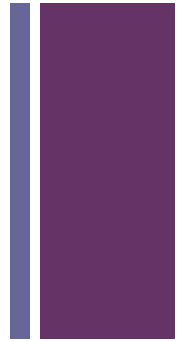
| Challenge                                   | Frequency |
|---|-----------|
| Parent compliance in scheduling appointment | 212       |
| Presence of middle ear fluid                | 179       |
| Infant has other medical/health issues      | 143       |
| Parents live far from testing facility      | 105       |
| Noisy results, repeat testing needed        | 104       |
| Parents have transportation problems        | 102       |
| Appointments are booked out several weeks   | 97        |
| Lack of timely referrals from screening     | 85        |
| “Other” reasons                             | 38        |
| Testing only available under sedation       | 6         |

# + Challenges in completing testing before 3 months of age



- “Other” reasons:
  - Reimbursement/Insurance coverage
  - Insufficient staff
  - Infant not properly prepared for testing
  - Lack of equipment
  - No shows for appointment
  - Parents and physicians lack understanding of importance

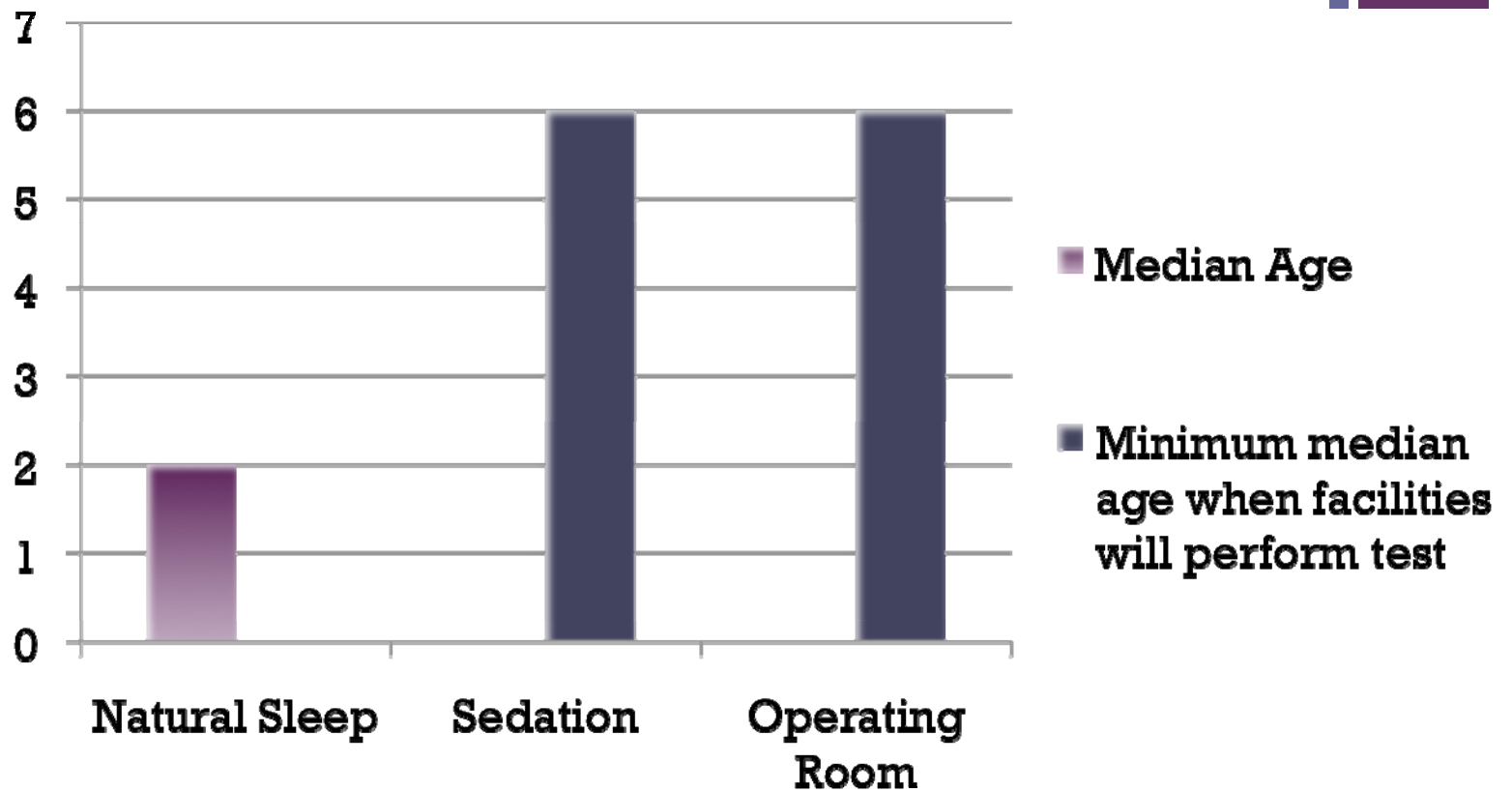
# + ABR Testing Conditions Available



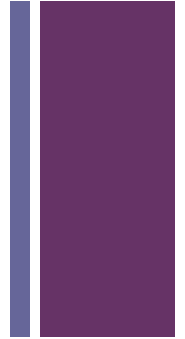
- Natural sleep: 296
- Sedated: 113
- Operating room: 133



# + Age at testing (in months)

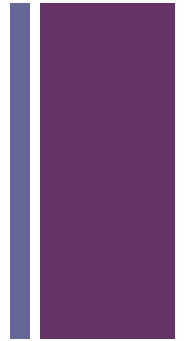


# + Range of ages at testing (in months)

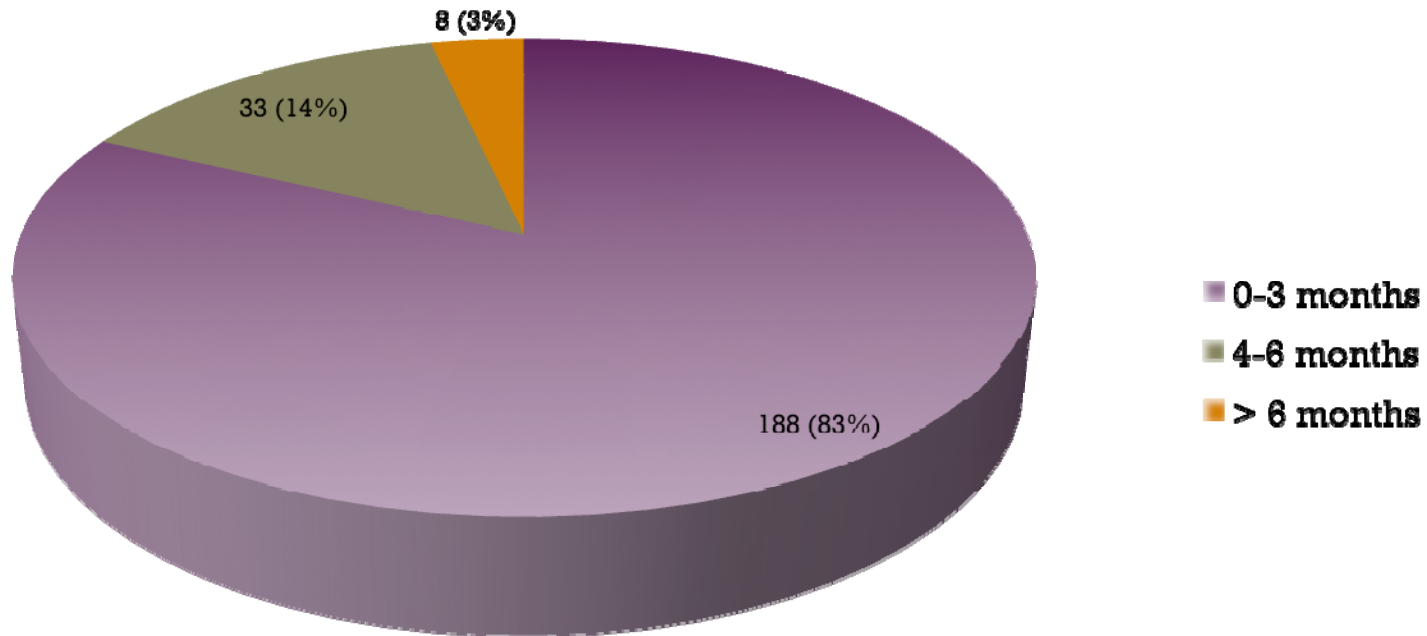


- Natural sleep (n = 229)
  - <1 to 24 months
- Sedation minimum age (n = 93)
  - 1 to 24 months
- Operating Room minimum age (n = 38)
  - <1 to 24 months

+ Average Age at Time of Testing:  
Natural Sleep ABR (n = 229)

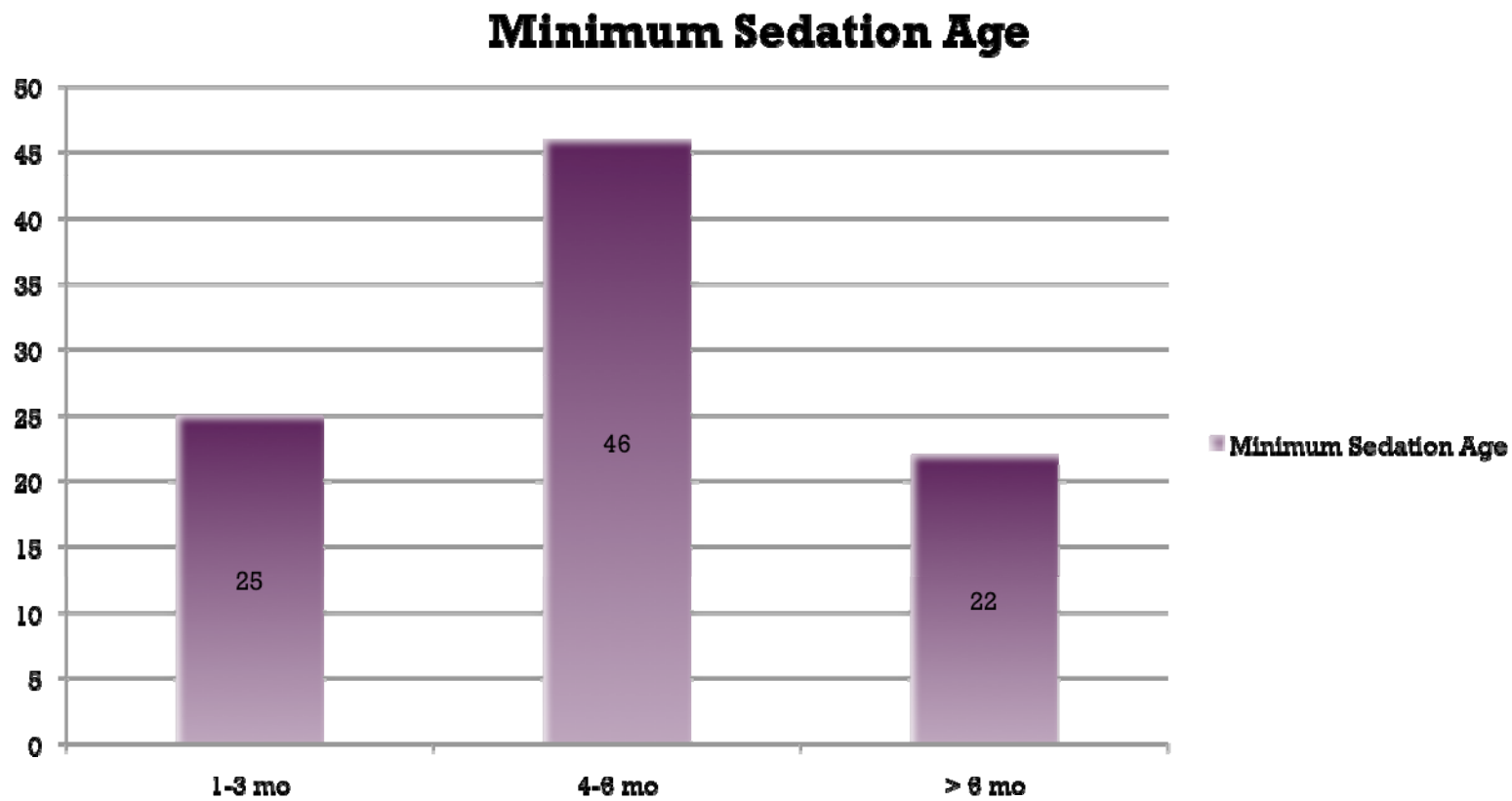
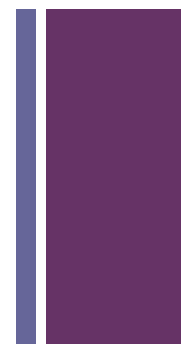


**Average Age at Time of Diagnostic Test**

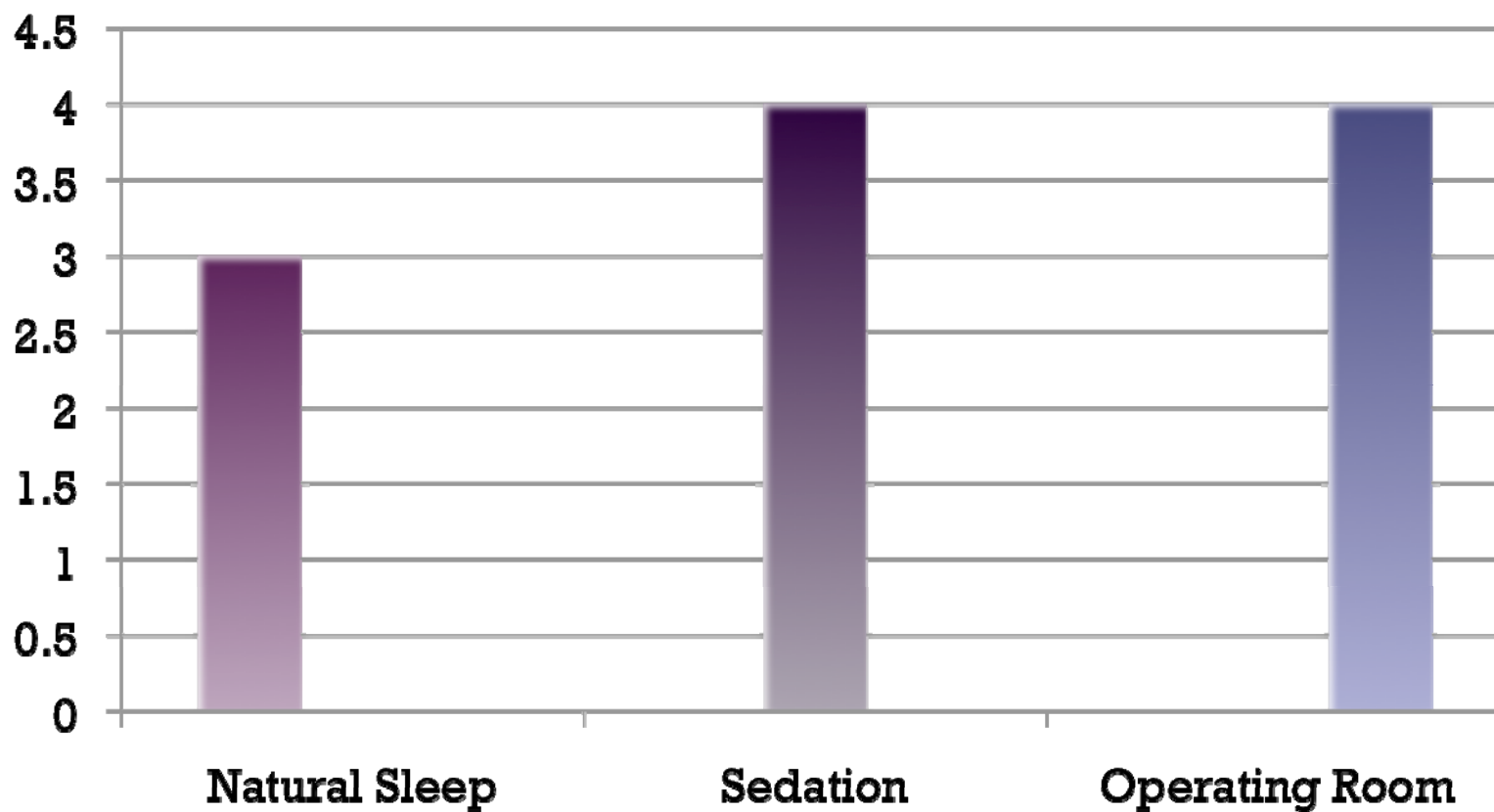
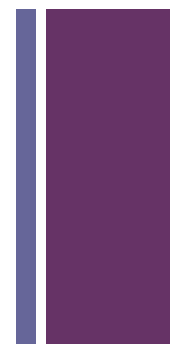


# + Minimum Sedation Age

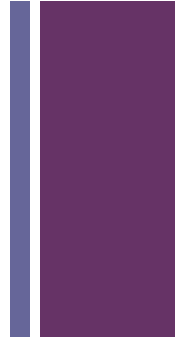
(n = 93)



+ Median wait time for appointment  
(in weeks)

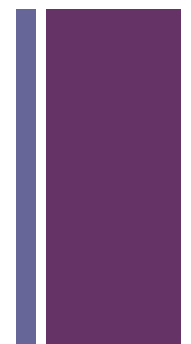


# + Range of Wait Times Based on Test Condition

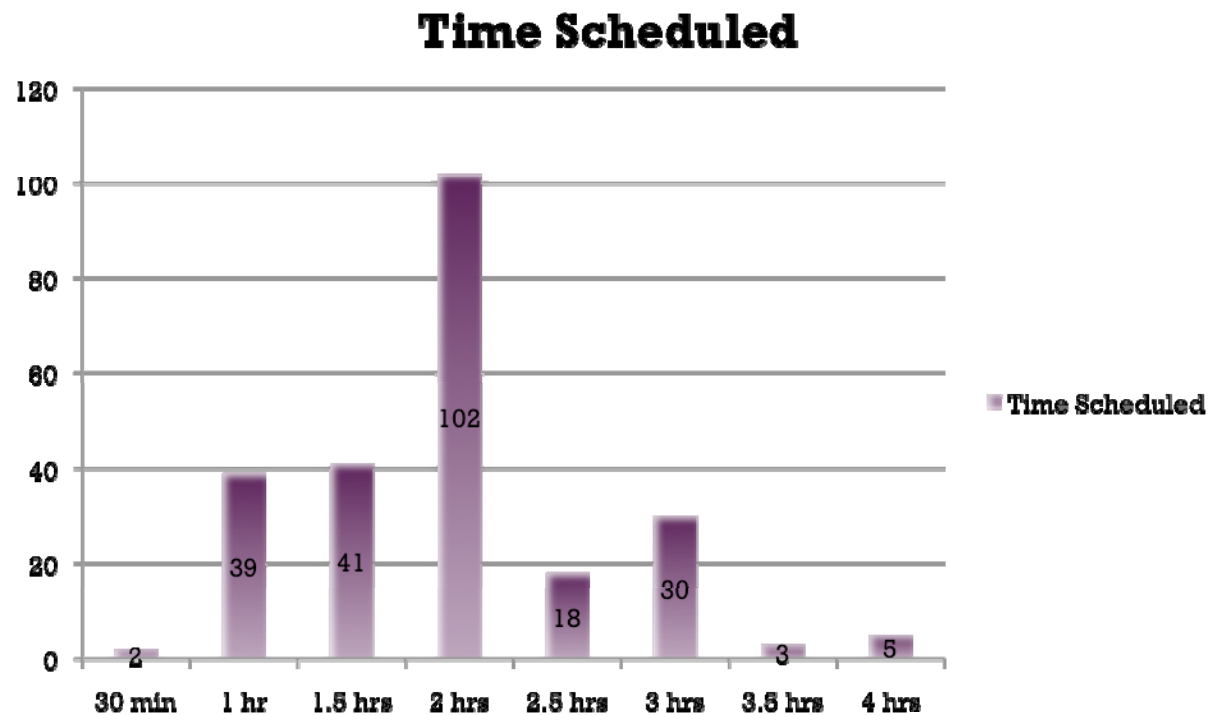


- Natural sleep
  - 3 days to 3 months
- Sedation
  - 4 days to 5 months
- Operating room
  - 6 days to 4 months
  - Note: many participants reported that wait time is dependent on the physician's schedule and is difficult to predict

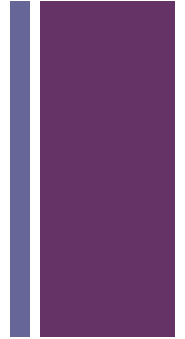
# + Natural Sleep ABR: Appointment Length: (n = 240)



- Median: 2 hours
- Range: 30 minutes to 4 hours



# + Natural Sleep ABR: Testing Challenges

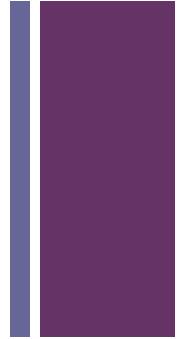


During the past six months, approximate percent of the ABR tests that:

- Could not be interpreted due to muscle movement noise? (n = 234)
  - 0% (n = 99)
  - 1 to 10% (n = 77)
  - 11 to 25% (n = 33)
  - 26 to 50% (n = 18)
  - > 50% (n = 7)
  
- Needed to be repeated to verify results? (n = 199)
  - 0% (n = 53)
  - 1 to 10% (n = 64)
  - 11 to 25% (n = 43)
  - 26 to 50% (n = 23)
  - > 50% (n = 16)



# + Natural Sleep ABR: Helpful Instructions

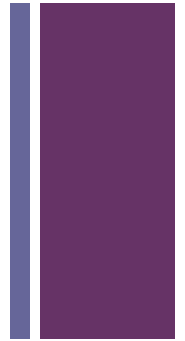


Instructions helpful for successful completion of test battery:

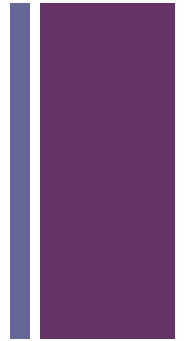
- Bring infant sleep deprived (n = 272)
- Bring infant hungry and ready to eat (n = 257)
- Bring items to comfort infant (e.g., pacifier, bottle, blanket) (n = 232)
- Do not put lotion on the infant's face (n = 62)
- “Other” instructions (n = 64)
  - Bring baby inside in the car seat
  - Do not let baby sleep on car ride to facility
  - Do not bring siblings
  - Feed baby on arrival
  - Schedule appointment during normal nap time

# + Sedated ABR

- Nurse available to monitor baby during procedure (n = 101)
  - 96 facilities have a nurse/physician available
  - 5 facilities do not provide monitoring
- Sedation agents used
  - 73 Chloral hydrate
  - 18 Propofol
  - 40 Other
    - Versed, Precedex, Dpravran, Phenobarb, Precedex, Phenegram Im ,  
Not sure
- Supportiveness of medical staff
  - 93 Very supportive
  - 15 Somewhat supportive
  - 3 Not supportive

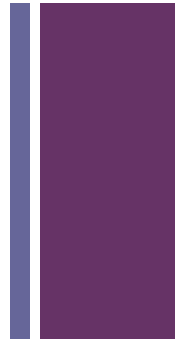


# + Sedated ABR: Testing Challenges



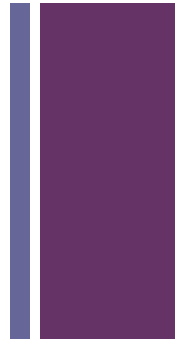
- During the past six months, approximately what percent of ABRs were you unable to get all of the diagnostic information needed?
  - 0% (n = 60)
  - 1 to 10% (n = 37)
  - 11 to 25% (n = 7)
  - 26 to 50% (n = 5)
  - > 50% (n = 6)

# + ABR completed in the operating room



- *All infants over a certain age (n = 38):* Results indicated that the median age was 6 months, and the range was from < 1 month to 24 months.
- *Infants with special needs (n = 79)*
- *Infants who cannot be safely sedated using a conscious sedation procedure (n = 54)*
- *Infants undergoing additional procedures (n = 116)*
- Supportiveness of medical staff
  - 103 Very supportive
  - 28 Somewhat supportive
  - 2 Not supportive

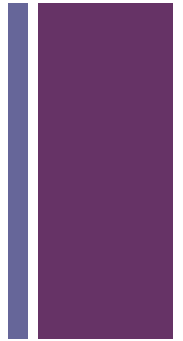
# + Recommendations



- Review the JCIH diagnostic test battery recommendations and compare with the test battery protocol in your clinic.
- Make certain that each audiologist on your staff is aware of the diagnostic testing recommendations and that a full battery is consistently obtained.
- Allow enough time in the appointment to obtain the full array of diagnostic information.
- If natural sleep ABR testing is not available at your center, consider adding this component so that diagnostic information can be obtained as soon as possible after receiving failed newborn hearing screening results.

# + Recommendations

- Be aware of the wait time in your clinic – make adjustments as needed so that the diagnostic evaluation appointment can occur in a timely manner.
- Assist physicians in your area to be informed of the diagnostic evaluation recommendations and the importance of obtaining complete information.
- Be prepared to provide families with unbiased written information on infant hearing loss and intervention options.
- Know who the early intervention providers are in your area so that appropriate services recommendations for families can be made.



# + Questions?

