Improving Outcomes of Hearing Screening in the Neonatal Intensive Care Unit (NICU)

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In 2010, Jacobs, Roush, Munoz, and White conducted a nationwide survey of hearing screening procedures employed in the neonatal intensive care unit (NICU). Managers of Early Hearing Detection and Intervention (EHDI) programs in all 50 states were asked to identify a person in each of their NICUs who was familiar with hearing screening procedures. A link was then provided to an electronic (Qualtrix) survey. Responses were obtained from 442 NICUs in 43 states.

In the fall of 2010, Bowman, Munoz, Jacobs, and Roush analyzed the findings for each state. Aggregate data were summarized for: 1) screening technology employed; 2) protocols used for rescreening and referral ; 3) challenges associated with hearing screening in the NICU, and 4) recommendations for improvement. A report will be mailed to each state in March, 2011, containing:

- Summary of aggregate findings for NICUs in the state
- Summary of the JCIH recommendations regarding NICU screening with a rationale for the procedures advocated
- NICU hearing screening checklist

Results

- There is considerable variability in methods and protocols employed in NICU screening
- Over one-third (36%) of the NICUs surveyed are using OAEs alone or in combination with ABR (note: using OAE's in the NICU is not in conflict with JCIH 2007 if it can be ascertained that the infants screened with OAEs are not at risk for auditory neuropathy).
- Only about half of the NICU's surveyed perform a rescreening by NICU personnel prior to discharge; there is considerable variability in the other half
- When a second screening is performed by NICU personnel, nearly three-fourths of the NICUs surveyed use ABR
- If a second screening is performed, many NICUs rescreen only the failed ear (39%)
- When infants are readmitted to the NICU for conditions that increase the risk of sensorineural hearing loss, over one-fourth of the NICUs surveyed (28%) do not rescreen
- There are many challenges to successful NICU screening including discharge/transfer prior to screening and referral, tracking, and surveillance following discharge/transfer.

If an infant does not pass the initial screening in your NICU, what follow-up is provided?

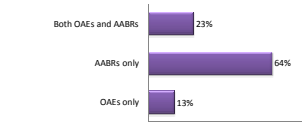
Answer	%
We provide a second screening by NICU personnel prior to discharge.	50%
We follow another protocol not listed above. Please describe the protocol you follow.	18%
We refer infants/families to an audiologist for follow-up.	16%
We provide a second screening by an audiologist prior to discharge.	11%
We refer infants/families to another professional (not an audiologist) for follow-up. In the space below, please specify the specialist(s).	5%
We alert parents/families of screening results, but don't provide a second screening or a referral for follow-up.	0%
Total	100%

If a second screening is necessary, what is the technology/protocol employed?

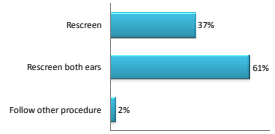
Response	%
We use ABR for the initial screening followed by re-screening with ABR.	73%
We use OAEs for the initial screening followed by re-screening with OAEs for infants who do not pass.	12%
We use OAEs for the initial screening followed by re-screening with ABR.	9%
We use another technology/protocol not listed. Please describe the technology and protocol you use.	5%
We use ABR for the initial screening followed by re-screening with OAEs.	1%
Total	100%

Results of a National Study (N = 414 NICU's)

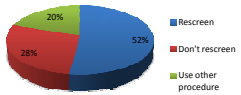
Describe the technology you use for initial hearing screening in your NICU:



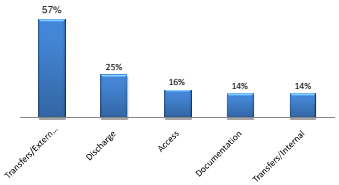
If a second screening is performed are both ears re-screened?



If an infant who passed the initial hearing screening is re-admitted for a condition associated with SNHL, what is the protocol?



What are the greatest challenges associated with infant hearing Screening s in your NICU?



Challenges

•High background noise levels
•Electrical interference
•Lack of education among non-audiology staff involved with hearing screenings
•Lack of qualified audiologists to provide follow-up
•Poor communication between hearing screening staff and other professionals within the hospital
•Equipment issues (not working well and/or too expensive to replace)
•Difficulty determining infants with high risk indicators
•Medical fragility and small size of infants

Changes Anticipated

•Purchase more equipment
•Revise protocol to better align with JCIH guidelines
•Transition to an electronic system for documentation of screening test results
•Increase or decrease the number of staff available to complete the screenings
•Expanded or improved staff education regarding hearing screening
•Better communication with families
•Notification of families whose infants have high risk factors to return for monitoring

Recommendations

•Improve guidelines for hearing screening following ototoxic medication
•Staff in-service on purpose and process of hearing screening
•Better information to parents and healthcare providers about hearing screening and follow up
•Screening and diagnostic follow up in the hospital prior to discharge
•Use of a tracking system for infants transferred to other hospitals
•Provide community resources to families when an infant is discharged
•Improve coordination between the infant's medical home and the audiologist

References

Jacobs, S., Roush, J., Munoz, K., and White, K. Hearing Screening in the NICU: Current Status and Future Needs. Presented at the National EHDI Conference, Chicago Ill, February, 2010.

Joint Committee on Infant Hearing (JCIH). (2007). Year 2007 Position Statement: Principles and guidelines for early hearing detection and intervention programs. *Pediatrics, 120*(4), 898-921.

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FAQ's Re: Hearing Screening in the NICU

What is the prevalence of permanent hearing loss in infancy?
The prevalence of sensorineural hearing loss in well-babies ranges from 1-3:1000 or 0.1 to 0.3%. It is at least 10 times higher for infants whose birth history required hospitalization in an NICU (10-20:1000 or 1 to 2%). Milder degrees of sensorineural hearing loss are also present at birth (0.6:1000 or 0.06%).

What is a 'sensorineural' hearing loss?
Sensorineural hearing losses include cochlear (inner ear) disorders, also known as "sensory" impairments, which account for over 90% of permanent hearing loss present at birth. Sensorineural hearing loss in children also includes "neural" impairments often referred to as "auditory neuropathy" or more recently "auditory neuropathy spectrum disorder" (ANSD) in recognition of the variable nature of this disorder. ANSD is characterized by absent or abnormal auditory brainstem responses in the presence of intact cochlear hair cell function.

How common is ANSD?
Although population based studies are needed, the prevalence of ANSD is higher than once thought and may account for 7-10 % of sensorineural hearing loss in young children.

What is the relationship between ANSD and NICU history?
NICU infants represent ~10% of the newborn population or approximately 400,000 infants per year. There is a growing body of evidence indicating that infants cared for in the NICU are at increased risk for 'neural' hearing loss. For that reason the Joint Committee on Infant Hearing (JCIH, 2007) recommends separate protocols for the NICU and well baby nurseries.

How do we detect ANSD?
Auditory brainstem response (ABR) screening is sensitive to ANSD; otoacoustic emissions are not (although some children with ANSD have absent or abnormal OAEs). For that reason the JCIH 2007 position statement expanded the definition of 'targeted' hearing loss from congenital bilateral and unilateral sensory or permanent conductive HL, to include "neural" hearing loss (i.e. ANSD). Specifically, the Joint Committee recommended that NICU infants admitted for more than 5 days should have ABR included as part of their screen so that neural HL will not be missed.

Why 5 days?
About 25% of NICU infants are considered "low" risk (this includes infants with diagnoses such as transient respiratory distress, observation for temperature instability, and negative sepsis workup). According to the National Perinatal Research Center, most of those infants are discharged by 5 days of age. Specific risk factors are often difficult for screeners to identify in the medical record so establishing a time criterion (>5 days) was considered by JCIH to be easier to implement. This may result in some over-referrals to audiology (or screening with ABR that could have been performed with OAE) but presumably fewer misses. It is implied in the JCIH 2007 Position statement that procedures may be modified if the NICU has well established criteria for review and/or screening for known risk factors.

What does JCIH say about rescreening NICU infants?
A complete evaluation of both ears is recommended even if only one ear failed the initial screen.

What about infants who require readmission to the NICU?
A repeat hearing screen is recommended prior to discharge for *readmissions* of infants in the first month of life, if there are conditions present associated with potential hearing loss