

# Hearing Screening in Infants with Severe Bronchopulmonary Dysplasia

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## Introduction

The Joint Committee on Infant Hearing (JCIH) endorses early detection and intervention for infants with hearing loss (JCIH 2007). The JCIH recommends the hearing of all infants be screened at no later than 1 month of age. Infants who do not pass a screening should have a comprehensive audiological evaluation at no later than 3 months of age. Infants with confirmed hearing loss should receive appropriate intervention at no later than 6 months of age.

Physiologic measures which include Auditory Brainstem Response (ABR) or Otoacoustic Emissions (OAE), must be used to screen newborns and infants for hearing loss. Separate protocols are recommended for Newborn Intensive Care Units (NICU) and well-infant nurseries (JCIH 2007). The JCIH recommends ABR technology as the only appropriate screening technique for use in the NICU, so that neural hearing loss will not be missed.

With the adoption of Universal Newborn Hearing Screening and development of Early Hearing Detection and Intervention (EHDI) systems, the percentage of infants receiving hearing screenings has increased (JCIH 2007). However, children with medical complications, including infants with severe bronchopulmonary dysplasia (sBPD), may be at risk for hearing loss, but may not be screened prior to hospital discharge. A review of hearing screening results for preterm infants with sBPD was completed.

## Objectives

1. Identify barriers to completion of hearing screening in the sBPD population.
2. Identify the percentage of patients with sBPD that fail hearing screening.
3. Propose guidelines to improve timely screening of medically complex infants with long-term hospitalization.

## Methods

A retrospective review was conducted on all identified cases that met the criteria of interest, including:

- Infants followed by the Newborn and Infant Chronic Lung Disease Program between September 2010 and June 2015
- Born at  $\leq 32$  weeks gestation
- Born with a birth weight  $< 1500$  grams

For each identified case, the audiologist performed a comprehensive medical record review in the electronic medical record system.

## Methods Cont.

Patients' medical histories including date of birth, gestational age at birth and date of admission were reviewed. Additionally, audiology consult order date, gestational age at time of order, as well as testing date and results were documented. The number of attempts to complete the hearing screening, deferrals from medical team, and results of inpatient hearing screening were examined. Outpatient appointments were also reviewed to determine if audiology follow-up was scheduled.

## Results

Two hundred twenty-one infants with sBPD met criteria. A total of seventy-seven infants were excluded from the study. Forty-nine (22%) infants with other comorbidities (i.e. congenital CMV, chromosomal anomaly, or deceased) were excluded. Twenty-eight (13%) infants were excluded because the medical team did not order a consult, detailed hearing screening results from an outside hospital were not provided, or testing could not be completed prior to discharge due to significant prematurity, medical complexity, or poor sleep state.

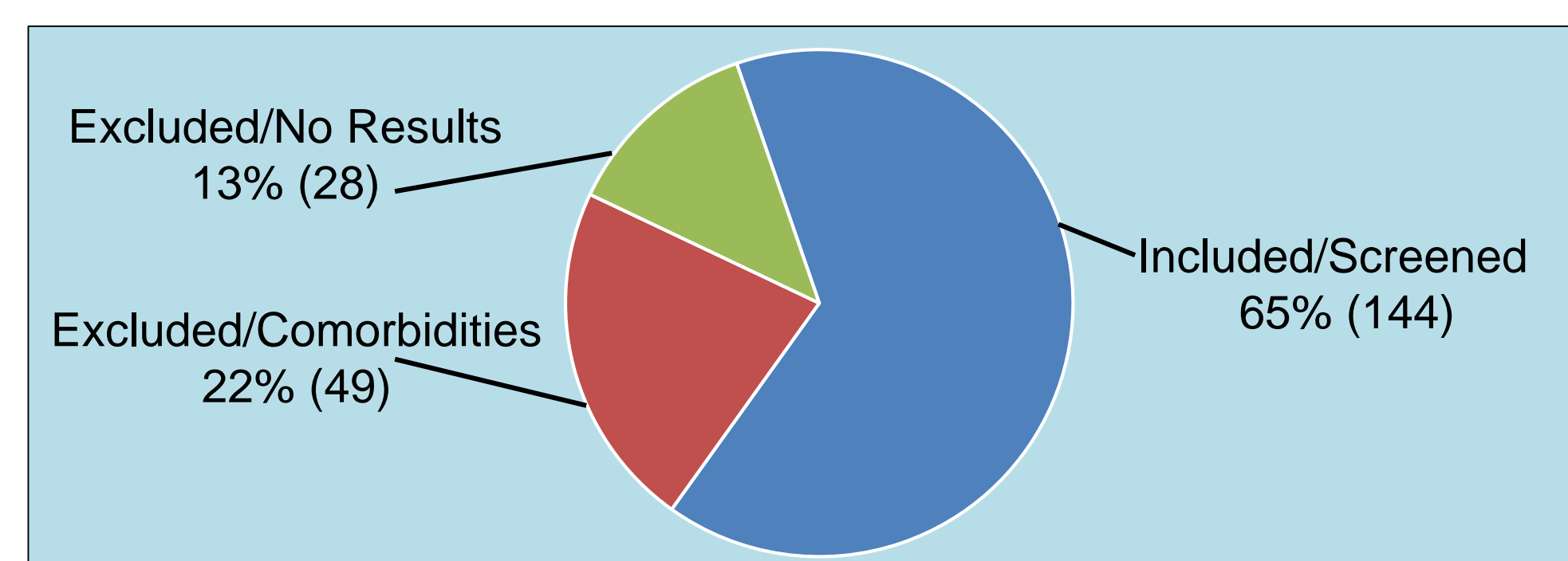


Fig. 1: Number of infants with severe bronchopulmonary dysplasia (sBPD) that were identified as meeting the criteria of interest.

A total of 144 infants received a hearing screening. Ninety-nine (69%) passed their initial ABR screening. Forty-five (31%) infants failed their initial ABR screening in one or both ears.

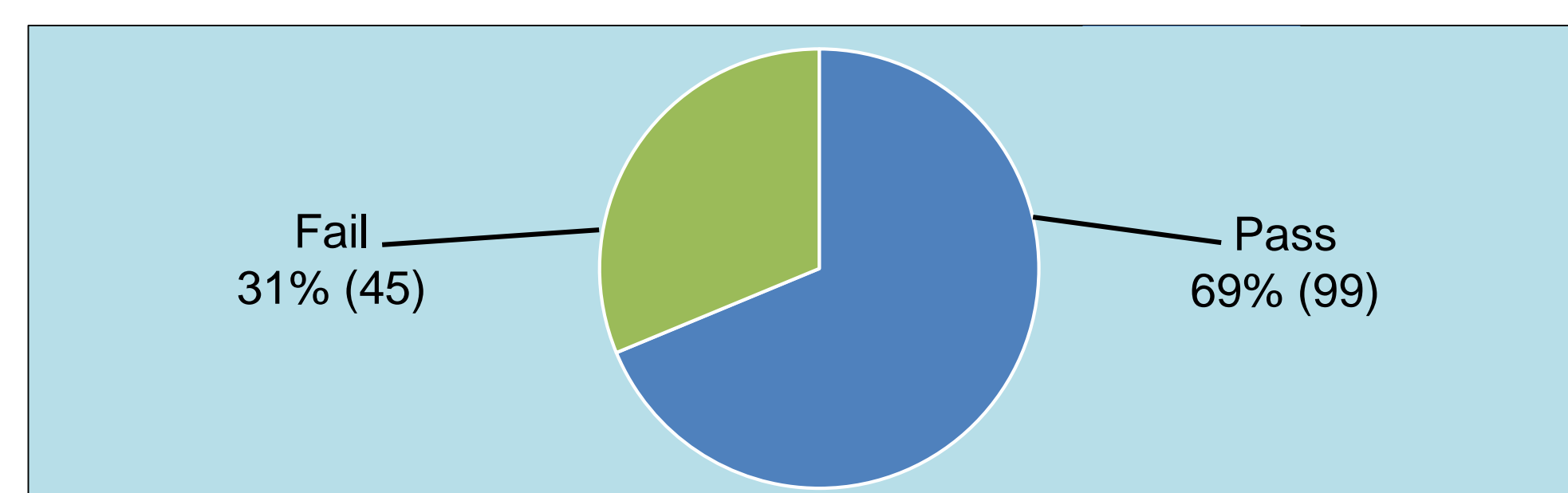


Fig. 2: The pass/fail results of Auditory Brainstem Response (ABR) screening for infants with severe bronchopulmonary dysplasia (sBPD).

## Discussion

Hearing screenings were frequently not completed due to patient illness or poor sleep state. In this study, the average age at admission was 3 months chronological age. Audiology was not consulted until 5 months chronological age (2 months corrected age). Thus, the average age at screening was approximately 7 months chronological age (4 months corrected age).

In the current study, 13% of infants did not receive a consult for a hearing screening. As the result of a recent Quality Improvement study, orders for audiological consultation are now entered upon admission for all infants, including those with sBPD, in the NICU. This blanket order system allows an audiologist to determine if and when a patient requires a hearing screening. The audiologist can monitor and attempt screening when the patient's medical status stabilizes. If needed, multiple attempts at audiological testing can be completed prior to the patient's discharge. Coordination with the medical team to order sedation, or attempts at testing after existing medications that may induce sleep are given, can also be arranged.

Patients with sBPD are often ventilator-dependent with tracheostomy placement and are at risk for chronic middle ear pathology. Unsuccessful attempts at screening, as well as chronic otitis media, may delay identification of permanent hearing loss. Current practice includes obtaining 1000 Hz tympanometry to document middle ear status. Tympanometric results may warrant consultation with an otolaryngologist, which could allow for medical management in coordination with other surgical procedures.

## Conclusion

Infants with sBPD are medically complex, which can make testing challenging. As a result, hearing screening is often delayed for infants with sBPD for a variety of reasons. Accurate and timely audiological assessment for infants with sBPD necessitates ongoing multidisciplinary management.

## Reference

The American Academy of Pediatrics, Joint Committee on Infant Hearing Screening. Year 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs. *Pediatrics*, 120 (4), 898-921.

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