

**Hearing Screen Referral Quality Improvement Study: Newborn Hearing Rates
Correlate with Day of Life and Mode of Delivery
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BACKGROUND: Congenital hearing loss affects 0.2-0.4% of newborns and must be diagnosed and addressed within the first few months of life in order to avoid long-term developmental delays. To ensure timely follow-up, universal hearing screening is conducted during the birth hospitalization in many countries. Although many newborn nurseries have policies on when to perform hearing screens, there is a paucity of published data on optimal timing especially for auditory brainstem response tests and referral rates remain 4-8x times higher than the true incidence of hearing loss.

OBJECTIVES: To determine whether day of life and mode of delivery affected auditory brainstem response (ABR) results in healthy infants with gestational age > 35 weeks.

DESIGN/METHOD: This IRB approved retrospective chart analysis reviewed 31,984 infants tested during a standard birth hospitalization at Prentice Women's Hospital Northwestern Medicine in Chicago, IL in 2014-2016. Per unit policy, ABR screens were performed after 6 and 12 hours of life for vaginally and cesarean-delivered infants respectively. For infants who failed initial screens, repeat ABRs were performed once prior to discharge. For infants who failed 2 ABRs during birth hospitalization, starting in January 2016, a 3rd screen was performed between 10-14 days post-discharge. Proportions tests/Chi-squared analyses were utilized to determine if likelihood of passing the hearing examination correlated with hour and day of life (DOL) at time of testing. Each analysis was performed independently in the vaginal and cesarean groups and groups were then compared in 10 hour increments. NICU infants were excluded as were infants who were first tested on DOL4 or greater.

RESULTS: Referral rates decreased in both in vaginal and cesarean-delivered infants with increasing day of life. 18.6% of infants delivered vaginally referred when first tested on DOL0, 14.7% on DOL1, 6% on DOL2 and 0% on DOL3 and beyond ($p < 0.05$). Of infants delivered by Cesarean section, 18% referred on DOL0, 16% on DOL1, 10% on DOL2 and only 5% on DOL3 and beyond ($p < 0.05$). When analyzing specifically by hour of life of testing, for the vaginal groups, statistical significance was achieved starting at 10-11 hours of life ($p = 0.04$) and for the C-section groups, statistical significance was achieved starting at 30-32 hours of life ($p = 0.02$). Referral rates in 2014-2016 were 3.63-4.3% of infants after the two screenings in the hospital. After instituting the free 3rd hearing screening 10-14 days after discharge in 2016, the audiology referral rate was lowered to just 0.77% of infants.

CONCLUSION: ABR referral rates are affected by mode of delivery and infant day of life. Optimizing timing of ABRs during the newborn period and adjusting the recommended start time based on these findings could lead to a decrease in unnecessary audiology referrals. Additionally, institution of an outpatient hearing screen program 10-14 days after discharge at the birth hospital could further reduce the referral rate and can serve as an important area for cost containment.