

Eliminating the Practice of Rolling Up “Switched Ear Results” Increases the Detection of Hearing Loss in UNHS Programs

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OBJECTIVE/ PURPOSE

Many successful Universal Newborn Hearing Screening (UNHS) programs use repeated objective hearing screening as inpatients (IP) and/or outpatients (OP) to minimize false positives and reduce the referral rates. However, there are no established criterion for combining the individual screens into a final PASS/REFER decision, that would balance the need for identifying all babies with hearing loss while keeping sufficiently low referral and false positive rates. Within this context, a study of “switched ear results” (one ear passes and later refers and the other ear refers and later passes) was conducted in a nationwide Pediatrix UNHS program using IP/OP screens with automated ABR technology.

SWITCHED EAR EXAMPLE

Hearing Screen
Right Ear: **REFER**
Left Ear: **REFER**
Decibel Level: 35

Hearing Screen
Right Ear: **REFER**
Left Ear: **PASS**
Decibel Level: 35

Hearing Screen
Right Ear: **PASS**
Left Ear: **REFER**
Decibel Level: 35

A common practice is rolling up switched ear results into a final **PASS/PASS** decision

The left ear **PASS** in screen #2 is combined with the right ear **PASS** in screen #3 as a single screen

Number of Screening Tests: 2 IP and one OP

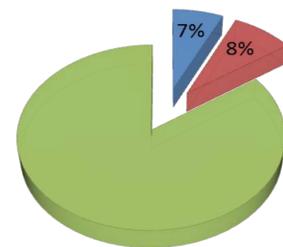
METHODS

Pediatrix Medical Group has over 370 UNHS programs in 29 states. The data is maintained in the Pediatrix web-based tracking and database management system, Soundata®. Most refers (72-74%) are tracked successfully and the audiological evaluations and/or intervention data is entered periodically in the database.

From January 2009 to May 2013, switched ear results were monitored and tracked with all refers. Of the 2,492,314 newborns screened in this period, 16,129 babies referred with 2,334 due to switched ear results.

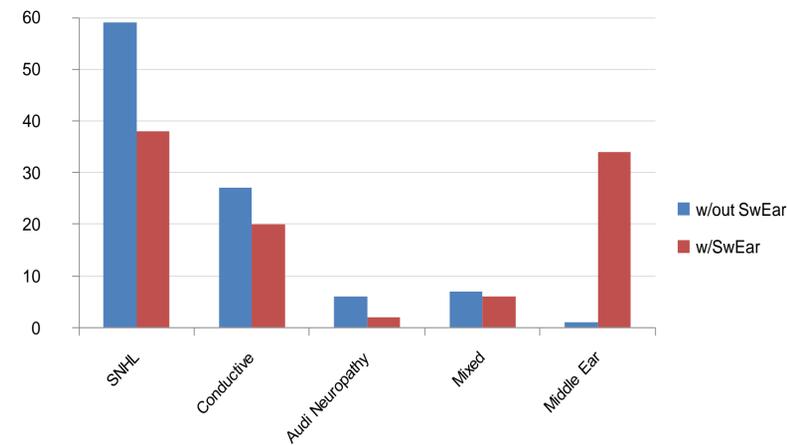
A retrospective study was conducted in 2014 using the hearing screening results, audiology/ENT diagnostic evaluations and intervention data to evaluate the effect of switched ear results on Pediatrix UNHS protocol performance. The incidence, nature of hearing loss and intervention data in the switched ear group was analyzed comparatively.

DIAGNOSED HEARING LOSS IN SWITCHED EAR



Out of the 2,334 babies with switched ear results, 15% had hearing loss and 7% of these were diagnosed with permanent hearing loss (PHL) including sensorineural hearing loss (SNHL), auditory neuropathy (AN), conductive or mixed hearing loss.

TYPE OF HEARING LOSS DIAGNOSED



The frequency distribution of HL in both groups (with and without switched ears) was comparable except for middle ear disorders which were more frequently found in the switched ear group. Also, CHL due to ear atresia is not included in the switched ear sample.

TYPE OF HEARING LOSS PER EAR AFFECTED

| Diagnosis | Unilateral | Bilateral | Total |
|---------------------|------------|------------|------------|
| SNHL | 27 | 96 | 123 |
| Conductive | 6 | 5 | 11 |
| Mixed | 4 | 15 | 19 |
| Auditory Neuropathy | 1 | 5 | 6 |
| Middle Ear | 42 | 153 | 195 |
| Total | 80 | 274 | 354 |

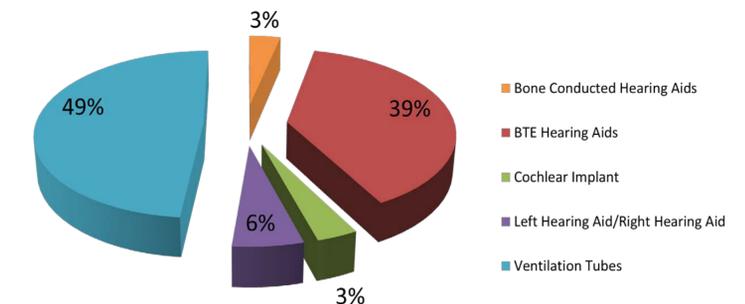
Switched ear results identified 274 babies with hearing loss in both ears and about half of them (121/274, 44%) had a permanent hearing loss that would require amplification. These babies would have been missed by the screening protocol as “false negatives” (hearing impaired babies with passing results) if switched ear results are rolled up into a final PASS.

SWITCHED EAR BY BIRTH LOCATION

| | Babies Screened | Babies Referred/Failed | Babies Diagnosed PHL |
|--------------|-----------------|------------------------|----------------------|
| NICU | 581 | 171 | 55 (9.40%) |
| WBN | 1,753 | 285 | 104 (5.90%) |
| Total | 2,334 | 456 | 159 (6.8%) |

Over one third (35%) of the babies diagnosed with permanent hearing loss were from the NICU which represents only 25% of the total switched ear sample. The relative proportion of PHL was higher in the NICU as compared to the WBN and the overall switched ear sample.

SWITCHED EAR RESULTS WITH INTERVENTION



Of those babies detected with hearing loss in the switched ear sample, 58% have received intervention. There were 7 babies with profound HL in both ears (6 SNHL, 1 AN) that have received cochlear implants and 98 babies (61%) were fitted for hearing aids.

CONCLUSIONS

Eliminating the practice of rolling up switched ear results as a PASS/PASS would further increase the yield of UNHS positive outcomes, identifying a significant number of babies with permanent hearing loss that would be otherwise missed. Tracking switched ears as refers, would minimize false negative results, ensuring the benefits of early detection and intervention for all babies diagnosed with PHL.