

Using Medicaid Data to Improve New-born Hearing Screening Follow-Up Reporting: Results from a Pilot Study

Tri Tran^{1,2}, Hsin-Yu Wang³,
Jeanette Webb²,
Mary Jo Smith²,
Patricia Soto⁴,
Terri Ibieta²,
Melinda Peat² and
Susan Berry^{1,2}

Abstract

Objective: The study aimed to determine if newborns received follow-up services by Medicaid audiologists or physicians after a failed hearing screening but were reported as loss to follow-up (LTF) or loss to documentation (LTD).

Methods: The study data included children born in 2012 who failed newborn hearing screening before hospital discharge and were reported as LTF / LTD. The data were linked to Medicaid data with service dates in 2012 and 2013. Matched records were used for follow-up verification.

Results: Among 682 records reported as LTF / LTD, 57 records were matched with Medicaid data. Of those, 38 records (21 LTF and 17 LTD) were used to verify follow-up status. After contacting the provider offices, follow-up status of 37 children was confirmed; testing results of 34 children were received. By reviewing testing results and verifying follow-up status, 12 children defined previously as LTF became "completed follow-up" and 13 children defined previously as LTD became "completed follow-up"; the percentage of improvement of follow-up reporting was 4% (25 / 638). One of the main reasons for not reporting follow-up was that providers and staff were unaware that they should report.

Conclusion: Physicians and audiologists who conducted follow-up testing did not always report results to Louisiana Early Hearing Detection and Intervention Program (LA EHDI). Routine linkage of Medicaid data coupled with follow-up verification can enhance the quality of newborn hearing screening follow-up reporting and improve communication between EHDI programs and follow-up providers.

Keywords: Data linkage; Medicaid; Early hearing detection and intervention; Loss to follow-up; Loss to documentation

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Introduction

Hearing loss is one of the most common congenital conditions [1, 2] and is associated with delayed development in language, learning, and speech [3-6]. Previous studies defined etiology of hearing loss as intraventricular hemorrhage; anomalies of the pinna, external ear canal, tympanic membrane, or ossicles; congenital cholesteatoma; genetic syndromes (e.g. Waardenburg's syndrome, Usher's syndrome, Alport's syndrome, and Turner's syndrome); infection (e.g., cytomegalovirus, syphilis, toxoplasmosis, group B streptococcal sepsis, etc.) [7]. Because the

most crucial period for language development is the first year of life [8], children with hearing loss should be identified early after birth so that timely, appropriate intervention can be initiated. The value of identifying hearing loss during the first few months after birth has been proven by many studies [3-6]. Because newborn hearing screening alone cannot assure identification of a permanent childhood hearing loss, infants who do not pass initial hearing screenings need to have additional hearing tests to confirm hearing status. Universal Newborn Hearing Screening (UNHS) is a program for early detection of permanent

- 1 Department of Pediatrics, Louisiana State University Health Sciences Center, School of Medicine, USA
- 2 Louisiana Department of Health and Hospitals (DHH) Office of Public Health, Children with Special Health Services Program, USA
- 3 Department of Epidemiology, Tulane School of Public Health and Tropical Medicine, USA
- 4 DHH Office of Aging and Adult Services, USA

Corresponding author: Tri Tran

✉ Tri.Tran@LA.GOV

Department of Pediatrics, Louisiana State University Health Sciences Center School of Medicine, USA.

Tel: 504-219-4450

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congenital hearing loss and has become the expected standard of care internationally. In 1993 UNHS was recommended by the U.S. National Institutes of Health Consensus Development Conference on Early Identification of Hearing Impairment in Infants and Children [9]. Currently, it has been well established in the United States. In Louisiana, UNHS was started in 2002. **Figure 1** presents a process of screening and reporting performed by the Louisiana Early Hearing Detection and Intervention program (LA EHD). One of objectives of the year 2007 Position Statement of the Joint Committee on Infant Hearing Screening (JCIH), is a diagnostic audiologic assessment completed by 3 months of age [10]. However, based on a report from the Centers for Disease Control and Prevention (CDC) using 2013 U.S. data, among infants who did not pass the newborn hearing screening, 41.3% had no documented diagnosis and 32.2% were lost to follow-up (LTF) or lost to documentation (LTD) for diagnosis [11]. Although previous studies identifying risk factors of LTF / LTD have been conducted [12-23], to our knowledge there are no published studies investigating problems of reporting LTF / LTD through using Medicaid data to verify LTF / LTD status. Medicaid in the United States is a government health insurance program for low income people who are unable to pay for health care. It is the country's largest source of funding for medical and health-related services for families and individuals with low income. In Louisiana, about 65% of live birth deliveries are paid for by Medicaid in 2012. The objective of this pilot study was to explore use of Medicaid data to determine if newborns received follow-up services by Medicaid audiologists or physicians after a failed hearing screening but were reported as LTF or LTD. The study findings may identify the benefits from using Medicaid

data and enhancing communication with follow-up providers to improve accuracy of follow-up reporting.

Methods

Study population

In 2012, there were 62,361 births in Louisiana. Of those, 65% of deliveries were paid for by Medicaid. The overall rate of newborn hearing screening was 98%, failure rate 6%, and LTF / LTD rate 27%. Among those who failed the screening, 73% of deliveries were paid for by Medicaid.

The study included only children born in 2012 in Louisiana who did not pass newborn hearing screenings prior to hospital discharge, who were reported as LTF or LTD, and whose deliveries were paid for by Medicaid as indicated on birth certificates. Screenings defined as failed or passed were dependent upon results of final tests using either auditory brainstem response (ABR) or otoacoustic emissions (OAE). Children who died before the follow-up appointment or whose mothers were not Louisiana residents at birth were excluded from the study. There were 682 children in newborn hearing screening (NHS) data who met inclusion and exclusion criteria and were included for analysis and linkage with Medicaid data.

Data sources and linkages

NHS data were linked to Medicaid claims data with service dates in 2012 and 2013. Medicaid data only included Current Procedural Terminology (CPT) codes of 92587 (OAE Limited Diagnostics), 92558 (OAE Screening), and 92586 (ABR Screening). These CPT codes corresponded to testing procedures used in hospitals for

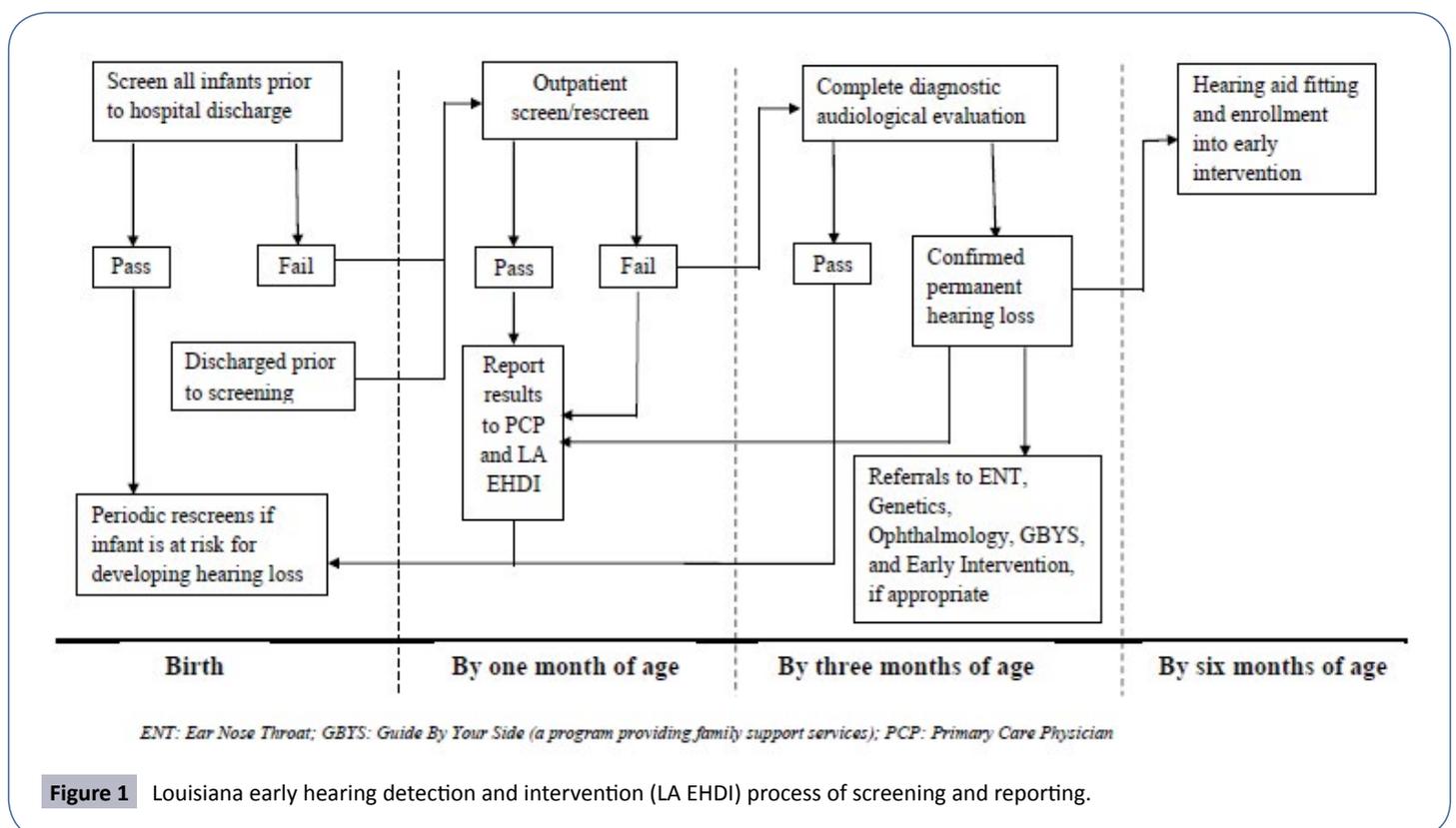


Figure 1 Louisiana early hearing detection and intervention (LA EHD) process of screening and reporting.

hearing screenings or for re-screening at outpatient facilities. Currently, Otoacoustic Emission (OAE) or Auditory Brainstem Response (ABR) testing is usually used to screen the hearing of newborns. ABR tests the auditory pathway from the external ear to the lower brainstem. OAE evaluates the function of the peripheral auditory system, primarily the cochlea, which is the area most often involved in sensorineural hearing loss [7]. Linking variables included child's SSN, date of birth, first and last name with soundex codes. The data linkages were conducted using SAS 9.3 and LinkPro 3.0.

Follow-up status definitions

Completed follow-up included babies who did not pass their NHS and completed the recommended further hearing test(s) reported to LA EHDI by testing providers (audiologists or physicians). LTF was defined if testing providers reported that children did not show up at the time of the scheduled follow-up appointment. LTD was defined if the LA EHDI program did not receive any report or documentation of follow-up or LTF from testing providers.

An unreported record of follow-up was assumed if a LTF / LTD record matched with Medicaid data had a length of time between the hearing test recorded in Medicaid data and the hearing test reported in NHS data greater than three days. In fact, through case review, matched records with the length less than or equal to 3 days were found as retested before hospital discharge due to failure of initial screening.

Follow-up verification

In order to verify follow-up status for matched records identified from the linkage, the LA EHDI Follow-up Coordinator used the list of matched records to contact audiologists and physicians whose names and contact information captured in Medicaid data. First, the Follow-up Coordinator contacted offices by fax, and then by phone if no response was received after three days. The phone call was repeated three times if necessary. Upon contact, results of the hearing tests were requested to be sent to the Follow-up Coordinator for review. Follow-up status and results of verified hearing tests were updated in LA EHDI database as needed.

Data analysis

Percentages of improvement of LTF / LTD after follow-up status verification were calculated. In addition, characteristics of verified follow-up were analyzed, including the most updated follow-up hearing test results, number of follow-ups, and time when the first follow-up started.

Ethics

Both the first author and Follow-up Coordinator were able to access all identified data used for the study through a Data Sharing Agreement between the state's Office of Public Health and Bureau of Health Services Financing. The study was determined to be a new routine activity and a quality improvement project performed by the LA EHDI program. The project did not meet the federal definition of human subjects research and was deemed exempt by Louisiana State University Institutional Review Board.

Results

Verification and improvement of follow-up status

Among 682 records reported as LTF / LTD, 57 records were matched with Medicaid data. Of those, 38 records (21 LTF and 17 LTD) with a length of time between the hearing test recorded in Medicaid data and the hearing test reported in NHS data greater than three days were used to verify follow-up status. Twenty-four audiologists' offices and fourteen physicians' offices were contacted. Ten offices responded by fax and 13 by phone. Only one office did not respond after three calls and fax. The total response rate by fax and phone was 97.4% (37 / 38). After contacting providers' offices, testing results of 34 children were received because hearing records of three children (two LTD and one LTF) were not found. By reviewing testing results and verifying follow-up services, 12 children defined previously as LTF became completed follow-up and nine remained the same; 13 children defined previously as LTD became completed follow-up, two changed to LTF, and two remained the same (**Table 1**). Thus, 25 records of LTF / LTD were changed into completed follow-up, which made an improvement of follow-up reporting about 66% (25 / 38) among matched records used to verify follow-up status, and 4% (25 / 682) of total LTF / LTD records.

Characteristics of verified follow-up

Among 12 children who were defined previously as LTF and became completed follow-up, 11 (91.7%) of those passed both ears and one (8.3%) failed one ear; nine (75.0%) and three (25.0%) completed one and two follow-ups, respectively; four (3.3%) completed the first follow-up within one month after NHS, three (25.0%) at one to two months; two (16.7%) at three to six months, and three (25.0%) after six months.

For the nine who were defined previously as LTF and remained LTF, hearing records of two children could not be found and hearing records of another child showed incomplete testing results. Of six children with hearing records found, three (50%) failed one ear and three (50%) failed both ears; three (50%) received one follow-up and three (50%) two follow-ups; one (16.7%) received the first follow-up within one month after NHS and five (83.3%) at one to two months.

Among 13 children defined previously as LTD who became completed follow-up, 12 (92.3%) of those passed both ears and one (7.7%) failed one ear; 12 (92.3%) completed one follow-up and one (7.7%) two follow-ups; six (46.2%) completed the first follow-up within one month after NHS, five (38.5%) at one to two months, one (7.7%) at three to six months, and one (7.7%) after six months.

For four children who were defined previously as LTD and remained LTD, hearing records of one child were not found, and the provider's office where the other child reportedly received follow-up did not respond. Of two children with hearing records found, one failed one ear and one failed both ears; each received two follow-ups; and both received the first follow-up at one month after NHS.

Table 1 Change of follow-up status among matched records (38) used to verify follow-up status.

Change of follow-up status after follow-up verification	Number	Percent	Follow-up status	Number	Percent
LTD reported previously changed to			Before follow-up verification		
- LTF	2	11.8	LTF	21	55.3
- Completed follow-up	13	76.5	LTD	17	44.7
LTD reported previously remained as LTD	2	11.8	Completed follow-up	0	0.0
Total	17	100.0	Total	38	100.0
LTF reported previously changed to			After follow-up verification		
- LTD	0	0.0	LTF	11	28.9
- Completed follow-up	12	57.1	LTD	2	5.3
LTF reported previously remained as LTF	9	42.9	Completed follow-up	25	65.8
Total	21	100.0	Total	38	100.0

LTF: Loss to Follow-up; LTD: Loss to Documentation

Of the children who remained LTF / LTD (total 13; 9 failed two ears and four failed one ear at screening), none of them was found in the hearing loss data. Thus, their eventual hearing status was still unknown.

Discussion

This pilot study used Medicaid data coupled with data verification through contacting follow-up providers to enhance accuracy of follow-up reporting. About 66% records of LTF / LTD were changed into completed follow-up among matched records used to verify follow-up status, which contributed about 4% to improvement of follow-up reporting. Based on results of the study we concluded that the hearing screening LTF / LTD rate has been more or less over-reported in Louisiana. Even among children who are reported as LTF, efforts to verify LTF status are recommended. The study found 12 children who were reported as LTF but became completed follow-up after follow-up verification. This occurred because children returned for follow-up after their follow-up status was reported and providers did not update follow-up status to the LA EHDI program. In addition, although six records reported previously as LTF remained the same follow-up status, most recent testing results from follow-ups were obtained and updated.

Through the study, we learned that routinely conducting linkages of hearing screening data with Medicaid data contributed to enhancing quality of LTF / LTD data reporting. In fact, verifying a true LTF / LTD is necessary before conducting any study seeking factors associated with LTF / LTD. In addition, the major advantage of contacting providers was to help the Follow-up Coordinator define reasons that providers did not report their patients' testing results or follow-up status to the state hearing screening program appropriately, and to give opportunities to provide testing providers with education on reporting follow-up. One of reasons for not reporting follow-up was that providers and staff were simply unaware that they should report. This was due to their lack of knowledge about LA EHDI as well as LA EHDI's unawareness of these testing sites. Once LA EHDI identified new or unknown testing sites, communication about the program and the importance of reporting to LA EHDI could be provided. The Follow-up Coordinator also found that several physicians providing hearing testing did not know to refer those babies who

did not pass to audiologists immediately. This was due to lack of communication between physicians and audiologists. Hoff et al. found that a lack of communication between and among health care providers and screening programs posed a barrier for follow-up success [20]. Strategies to improve communication between and among health care providers and screening programs, and knowledge of providers about screening were discussed in a study of Shulman et al. [15]. Of those strategies, the role of newborn hearing screening database systems, where providers are able to access and share their contact and specialty, has been proven to enhance communication among providers. As indicated in Joint Committee on Infant Hearing 2007 and the study of Pool, a lack of integrated data management and tracking systems creates barriers to sharing information among providers and between states [10, 24]. In addition, the CDC emphasizes the importance of an EHDI tracking and surveillance system, which will allow case managers and authorized health care providers to access relevant information about infants and children and can minimize LTF [25, 26]. Furthermore, through communication with providers, the Follow-up Coordinator learned that some physicians did not refer failed babies to audiology facilities. Those physicians may take a "wait-and-see" attitude about newborns who did not pass the hearing screening. This attitude was considered as a major obstacle to successful follow-up in the study of Shulman et al. [15], and explained why many children were not diagnosed until they were of school age [27]. Participating in American Academy of Pediatrics (AAP) sponsored and colleague-to-colleague trainings may improve a "wait-and-see" attitude among physicians [15].

Because the LTF / LTD rate is still high in Louisiana (27% in 2012), all efforts to reduce LTF / LTD and identify its causes are very meaningful. Thus, use of any additional data source such as Medicaid data to define a true follow-up status for every single baby is valuable and realistic. The monthly linkage is advised using the most updated hearing screening and Medicaid data so that the follow-up status is verified as early as possible. Once the procedure of linkages with Medicaid data and follow-up verification becomes a routine activity for LA EHDI program to improve follow-up reporting, it will be conducted monthly. With a well-experienced linkage staff, the linkage using monthly data can be completed in 4 hours or less. In addition, assuming that about 2-5 matched records are used for follow-up verification each month, the total amount of time to verify follow-up status is

less than 8 h. Thus, it is worth the effort and cost to link and use Medicaid data to improve follow-up reporting. Beyond the ability to define a true follow-up that occurred but was unreported, this project offers opportunities to provide education for follow-up reporting and also increases communication and awareness, particularly with facilities providing audiologic follow-up.

As a result of the success of this study, similar data linkages with Louisiana Women, Infant, and Children (WIC) program have been conducted recently. WIC is a government assistance program of the food and nutrition service for low-income pregnant women, breastfeeding women, and infants and children under the age of five in the U.S. A high match rate (66%) was found when linking 2014 LTF / LTD data to 2014-2015 WIC data. The matched data include identified information of WIC program location, parents, children, primary care physician (PCP), and audiologist when available. LA EHDl program has developed a plan to conduct a pilot study using matched WIC data among LTF / LTD children who attend WIC clinics in the north part of state. Specifically, LA EHDl will contact families of LTF / LTD children to schedule a place and time for a re-screening at a local WIC clinic, a parish health unit, or even at a pediatric facility. Screeners will be hired and trained to rescreen those children. We are also working toward similar data linkage with Maternal Infants Early Childhood Home Visiting (MIECHV) data. The MIECHV includes two programs: Parents as Teachers (PAT) and Nurse Family Partnership (NFP). Using matched data, LA EHDl will be able to provide these programs with child-specific data for PAT and NFP participants with the child's hearing screening follow-up status in order for the Parent Educators and home visiting nurses to assist families in receiving needed follow-up testing. Currently, LA EHDl is providing in depth training to home visitors about newborn hearing screening, the importance of timely follow-up when needed, and hearing loss. The MIECHV programs are provided with materials and specific training for parent education during home visits to help families better understands hearing screening, the procedures and local resources for follow-up, and for ongoing monitoring of risk factors. In addition, the programs are given information to share with primary care providers since collaboration with the medical home are an integral part of MIECHV.

Strengths and limitations

This study had three major strengths. First, the study used Medicaid claims data that captured if only serviced were conducted and paid. Second, unreported follow-ups defined

through data linkages were verified and confirmed by contacting follow-up providers. Last, the response rate was high (37 / 38); staff and providers of contacted facilities were very cooperative in providing testing results when available and accepting reporting education by the Follow-up Coordinator.

The findings in this study were subject to two limitations. First, the study included only three CPT codes (92587, 92558 and 92586) corresponding to the testing procedures most used in the hospital for hearing screenings or in a re-screening at outpatient facilities. Adding other hearing diagnostic CPT codes (92588: OAE Comprehensive Diagnostic Code; 92585: ABR Diagnostic Code) into data linkages may bring more matched records and improve results of the study. Second, because of the small number of records used in follow-up verification, no statistical test was used in the study. In addition, due to the small number of testing providers and confidential issues, the frequencies of reasons not reporting follow-up were not shown.

Conclusion

Physicians and audiologists do not always report follow-up testing results to LA EHDl program, leading to over-reporting of LTF / LTD. Linkage of newborn hearing screening data with Medicaid and other data sources can be used to identify providers who are not reporting, and thereby enhance the quality of both follow-up data reporting and services. Data linkages conducted on a regular basis could improve timely reporting of follow-up hearing test results.

This study also provided the LA EHDl Follow-up Coordinator and the LA EHDl AAP Chapter Champion opportunities to work with physician offices to improve communication amongst health care providers, and to provide resources for needed referrals. Physicians and audiologists who conduct infant hearing tests should work with their state EHDl programs to improve follow-up reporting and management of children with hearing loss.

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