Original Article

Artigo Original

Neonatal Hearing Screening in primary health care and family health care

Rastreamento e monitoramento da Triagem Auditiva Neonatal em Unidade de Estratégia de Saúde da Família: estudo-piloto

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Keywords

Neonatal Screening
Hearing Loss
Integrality in Health
Public Health Surveillance
Family Health Strategy
Child Health Services

ABSTRACT

Purpose: The Universal Newborn Hearing Screening (UNHS) looks for early diagnosis and rehabilitation of newborns at risk or not of hearing impairment. The purpose is analyze the flow of Universal Newborn Hearing Screening in the family health care strategy unit through the tracking and monitoring of children. **Methods:** This is a quantitative and retrospective study. The trace begins with the third copy of the Live Newborn Declaration, filled in at the maternity ward. An interview with parents and guardians was made by a community agent at the Health Unit or at the home of the newborn. Monitoring was conducted by live birth declaration and the information collected by the interviewer from maternal and child health booklet and the follow-up at high complexity services. **Results:** The sample was made up of 50 neonates. 52% were between 30 and 89 days and 54% were male. 12% of newborns presented a risk factor for hearing loss and the neonatal screening was performed in 86% of cases. Hearing health measures show integrality in hearing impairment care at the basic health unit to high complexity hospital. **Conclusion:** The flow of care for newborn hearing screening is in agreement with the child health care guidelines in Curitiba, however, it is not yet universal. In conclusion, the participation of the family health strategy unit in the tracking and monitoring of children submitted to the Universal newborn hearing screening program is feasible and recommended.

Descritores

Triagem Neonatal
Perda Auditiva
Integralidade em Saúde
Vigilância em Saúde Pública
Estratégia Saúde da Família
Serviços de Saúde da Criança

RESUMO

Objetivo: A Triagem Auditiva Neonatal Universal (TANU) visa ao diagnóstico precoce e à reabilitação de neonatos em situação de risco ou não para deficiência auditiva. O objetivo principal foi analisar o fluxo de Triagem Auditiva Neonatal Universal em Unidade de Estratégia de Saúde da Família por meio do rastreamento e monitoramento das crianças. **Método:** É um estudo retrospectivo, quantitativo. O rastreamento foi realizado a partir da terceira via da Declaração de Nascido Vivo preenchida na maternidade. O monitoramento foi realizado pela ficha de acompanhamento do recém-nascido preenchida pelo agente comunitário e uma entrevista com os pais ou responsáveis, na unidade da Secretaria Municipal de Saúde, ou por visita domiciliar. Também foram coletadas informações na caderneta de saúde da criança e acompanhamento em serviços de alta complexidade. **Resultados:** A casuística foi constituída por 50 neonatos, sendo que 52% deles estavam entre 30 e 89 dias de vida e 54% eram do gênero masculino. Apresentaram fator de risco para deficiência auditiva, 12% dos neonatos e 86% realizaram a triagem neonatal. As ações em Saúde Auditiva mostram que está havendo integralidade de atendimento na etapa hospitalar e ambulatorial, na unidade básica de saúde analisada e em serviços de alta complexidade. **Conclusão:** O fluxo de atendimento em Triagem Auditiva Neonatal Universal converge para a Diretriz de Atenção à Saúde da Criança Curitibana, mas ainda não é universal. Concluindo-se assim, que a participação da Unidade de Estratégia de Saúde da Família, no rastreamento e monitoramento das crianças submetidas ao programa de Triagem Auditiva Neonatal Universal no município, é viável e recomendada.

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Received: July 05, 2016

Accepted: February 17, 2017

Study carried out at Universidade Tuiuti do Paraná – UTP - Curitiba (PR), Brazil.

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Financial support: nothing to declare.

Conflict of interests: nothing to declare.

INTRODUCTION

Hearing is essential in the process of development of communication between the individual and the environment in which they live. So that a child can acquire language and develop speech, they need to be able to detect, locate, discern, memorize, recognize and understand sounds. These abilities stimulate cognitive development, important for the neuro-linguistic, social and emotional development of the child[1-3].

The international[4,5] and national[3,6-9] literature recommends hearing screening and the monitoring and follow-up of the development of hearing and language in neonates at risk or not of hearing impairment. Early diagnosis and intervention in hearing impairment is essential for the development of language, speech and learning, which can guarantee better life conditions for the individual.

Numerous Neonatal Hearing Screening (NHS) programs are being implemented in a number of cities throughout Brazil, as well as a series of assessment procedures, which are being proposed by researchers and committees from the field[3,6-9].

In the United States of America (USA), in 1993, with the aim of identifying hearing impairments in small children, the National Institute of Health[10] recommended that all newborns, both those at high and low risk, be submitted to hearing screening before being discharged from hospital and that intervention and full treatment of infants identified with hearing impairment should be an integral part of the universal screening program. Subsequently, the Joint Committee of Infant Hearing (JCIH)[5] endorsed the program, whose aim was the universal detection of infants with hearing impairment, reaffirming that they should be identified before three months of age and receive interventions by around six months.

In Brazil, the Federal Speech Therapy Council (CFFa) released a Review (nº 05/00), outlining the need to implement Hearing Screening for Neonates using objective methods, such as Evoked Otoacoustic Emissions (EOAE) and the Brainstem Auditory Evoked Potential (BAEP)[7]. In 2007, the Multiprofessional Committee on Hearing Health (COMUSA) began to recommend quality indicators for the implantation and evaluation of measures for complete hearing health care during infancy[3].

The National Council for Speech Therapy, in a groundbreaking report into hearing health throughout Brazil[11], inspected 95 public and private institutions, university hospitals and philanthropic entities, of medium to high complexity, accredited to provide this type of care for the population. The research had the aim of mapping the centers that strictly follow the Ordinance nº 587/2004 of the Ministry for Health that instituted speech-language therapy services in the State Hearing Health Care network. According to the study, 54 centers nominated themselves as high complexity and 41, medium complexity. The report further showed that, of the 95 centers inspected, 71 preferred to attend primarily the elderly, while children had care priority in only 16 services and adults, in 17 centers with accredited references. Another finding was the number of institutions that provided neonatal hearing screening: 39 carry out the exam for all newborns and 12 admitted carrying it out for infants in situations of risk.

Numerous authors[12] estimated and described the coverage of neonatal hearing screening (NHS) for users of the Universal Healthcare System (SUS) in Brazil, between 2008 and 2011. The national coverage of NHS for users of the SUS was estimated to be 7.1% in 2008, reaching 21.8% in 2011, showing evidence of inter- and intra-regional inequalities. Greater coverage was observed in Rio Grande do Sul (60.1%) and Paraná (59.4%), while Rondônia, Espírito Santo and Pernambuco presented coverage below 5% in terms of Brazil at large. Even in 2011, over two thirds of neonatal users of the SUS were not submitted to hearing screening, which was the year following the promulgation of the national law that established the procedure as obligatory. The authors concluded that, though the scenario had improved, the goal of universal coverage had still to be achieved.

Various authors[13] indicate the need for strategies of inclusion for Basic Care in the Universal Neonatal Hearing Screening (UNHS) program to facilitate the effectiveness of the program in tracking and monitoring children with and without Indicators for Risk of Hearing Impairment (IRDA).

For the aims of the study, we worked from the assumption that the UNHS of the Municipal Secretary of Health (MSH) of the Municipality, at the Strategic Family Health Care (SFH) Unit would be compatible with the Health Care Guidelines for Children of the Municipality [14].

The aim of the present study was to analyze the UNHS flow at the SFH units using tracking and monitoring of children.

METHODS

The study was approved by the Research Ethics Committee of the Brazil Platform (CONEP) on 1/10/2013, with CAAE: 22440613.3.0000.0103 and by the Research Ethics Committee of the Curitiba Municipal Town Hall, on 13/11/2013, in the review nº 66/2013. All the participants signed the free informed consent.

It is a retrospective, quantitative and observational study with a reference population of 194 children from both genders, with zero to one year of age, from nurseries from the metropolitan region of the municipality, with or without risk factors for hearing impairment. This population was attended and registered within the Family Health Care Strategy – FHS in the Primary Health Care Unit – PHU of Bairro Alto, by a multi-professional team. Based on the monthly newborn reports, a random sample of 50 individuals was selected, throughout the period from August 2013 to July 2014.

Tracking was conducted using the third copy of the Live Newborn Declaration, filled out at the maternity ward with registered data for address sent by the Epidemiological Inspectorate. Monitoring was undertaken by the researcher over one year, using the Newborn Monitoring record filled out by the community agent, and subsequently, via interview with the parents or responsible guardian, at the time of check-up of the child at the Municipal Health Secretary – SMS unit, or via house calls after the child was discharged from hospital. House calls were conducted by the researcher, accompanied

by a community agent. Information regarding the UNHS was also collected in the health notebook of the child and during follow-up with high complexity services.

The statistical analysis of the present research was performed using descriptive and quantitative methods (absolute and relative frequency tables and Average, Minimum, and Maximum and Standard Deviation by age).

The analysis of the data was realized based on the variables: characterization of newborns in terms of UNHS data, involving age in months at the time of interview, gender, birthplace, time and place of realization of screening, data of the person responsible for the care of the child and data/information regarding UNHS. Information regarding pre-natal, hospital/maternity ward, Primary Health Care Unit, characterization of care at the High Complexity Hearing Evaluation Service and as a care flowchart (as determined by the Care guidelines for the NHS of the Ministry of Health[9] and in the Health Care Guidelines for Children from the Municipality[14]), was collated, aiming to analyze the efficacy of the measures.

Figure 1 shows the flow chart for the present study.

RESULTS

In terms of the cases, it was observed that the majority of the interviews, 52%, were carried out when the child was between 30 and 89 days old. The average age of the participant from the sample at the time of interview was 82.06 days, with a minimum of six days and a maximum of 300 days for one of the individuals. (a case of and Intensive Care Unit (ICU) leaver/premature who remained hospitalized for 8 months, and for whom the hearing screening, was realized only after being discharged from hospital). In terms of gender, 54% of neonates were male.

In Table 1, it is possible to observe the presence of risk factors and types of risk for hearing impairment. The results show that 12% of neonates presented risk factors for hearing impairment, with

Table 1. Risk and type of risk for hearing impairment, (N=50)

RISK AND TYPE OF RISK FOR HEARING IMPAIRMENT	ABSOLUTE FREQUENCY (N)	RELATIVE FREQUENCY (%)
Risk for hearing impairment		
Yes	6	12
No	44	88
Type of risk for hearing loss		
ICU Leaver	1	2
ICU Leaver /malformation – Hydrocephalus	1	2
ICU Leaver/premature	3	6
Use of psychotropic	1	2
None	44	88

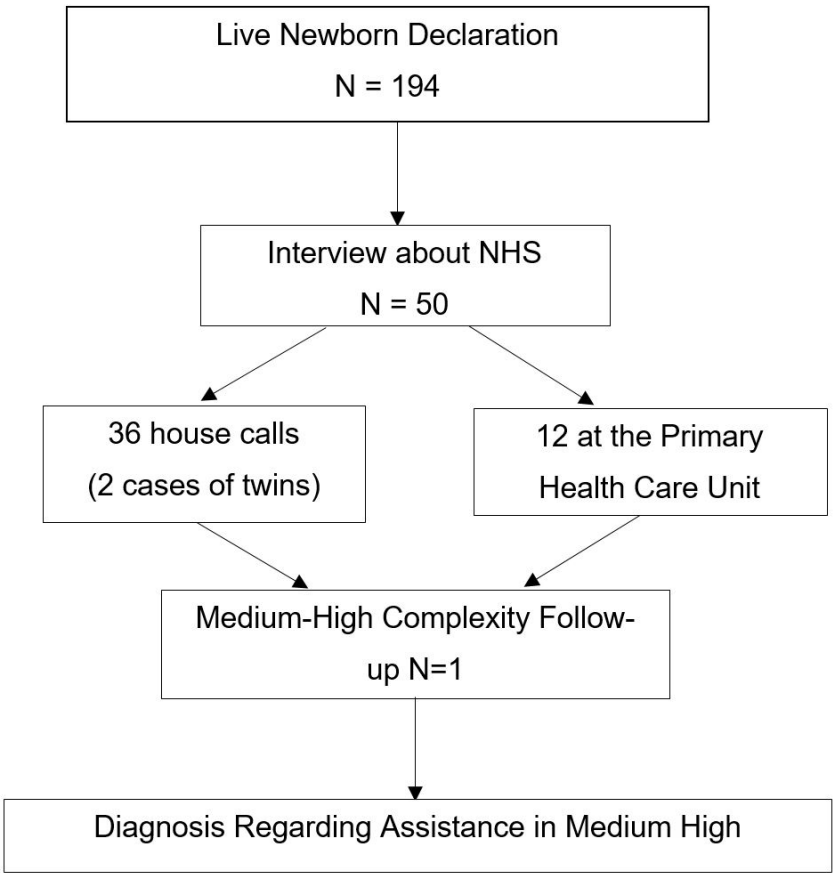

Figure 1. Procedures flowchart

possible risks being: 2% ICU leavers, 2% ICU leavers /congenital malformation and 2% due to the use of psychotropic medications (haloperidol/levomepromazine) by the mother during pregnancy. In the last case, the newborn underwent two transient otoacoustic emission exams ('small ear' test) at the maternity ward: the first at up to 48 hours after birth and the second at some time during follow-up, both proving to be normal.

Table 2 shows the medical complications of the mother, obtained from the Child Health Care Notebook, in the data regarding pregnancy, partum and post-partum periods. The majority of mothers (64%) had no medical pathologies. Amongst the mothers who presented medical alterations (36%), 8% gave birth to twins, 4% had premature birth and the other alterations, which totaled 20%, were: anemia, depression, diabetes, diabetes/arterial hypertension, arterial hypertension/cytomegalovirus, hypertension/premature birth, urinary tract infection, post bariatric surgery pregnancy, radiotherapy due to neoplasm of the thyroid and smoking. Four percent of maternal medical pathologies reported were associated with cases of placental abruption and were not related to hearing loss.

Table 3 presents the distribution of the sample following the realization of NHS. It was found that 76% underwent the NHS during the first month of life, with 92% undergoing the test while at the hospital, and 8% at the outpatient clinic after being discharged. Amongst the reasons reported for not realizing the NHS, 25% did not undergo the test due to the hospital not possessing screening equipment, 58% because the health of the child did not permit it and 17% due to difficulties with their health plan. Around 30% received information regarding neonatal hearing health.

In terms of NHS results, 94% passed and 6% failed. Three newborns from municipal hospitals were referred for retesting. In the retest, two neonates passed and one failed (Table 4).

Table 2. Maternal medical complications and their distribution/types

CHARATERIZATION OF MATERNAL COMPLICATIONS	(N)	(%)
Maternal complications		
Yes	18	36
No	32	64
Distribution of complications		
Anemia	1	2
Depression	1	2
Placental abruption	2	4
Diabetes	1	2
Diabetes/arterial hypertension	1	2
Twins	4	8
Arterial hypertension/Cytomegalovirus	1	2
Arterial hypertension/Premature birth	1	2
Urinary Infection	1	2
Premature birth	2	4
Post-bariatric surgery	1	2
Radiotherapy/Thyroid	1	2
Smoker	1	2
None	32	64

Table 5 presents the results related to information received by the families, regarding hearing health. The results show that 76% of the families did not receive information regarding hearing health and, of the 24% that did, the majority of the information was provided by doctors and other health care professionals, with: 10% being Doctors, 4% Nurses, 8% Speech-Language Therapists, and 2% Social Workers. Regarding the health care services, in none of the cases, was an active search according to hospital carried out. There was consultation with specialist doctors in only 2% of cases, with the specialty being otolaryngology. According to the criteria for medical monitoring of children considered at risk, 24% received monitoring and 76% did not receive or were not included in this criteria.

Table 3. Distribution of sample according to realization of NHS

CHARACTERIZATION OF NHS (N 50)	(N)	(%)
Realized during the first month of life		
Yes	38	76
No	12	24
Place of realization of screening		
Public or Private Hospital	46	92
Health plano or UBS clinic	4	8
Reason for not carrying out screening at the hospital/Clinic in the first month (n=12)		
Hospital without screening equipment	3	25
Health of child did not permit	7	58
Difficulties with health plan	2	17
Information received by the family about NHS		
Yes	15	30
No	35	70

Table 4. Result of NHS during testing and retesting

RESULT OF NHS	ABSOLUTE FREQUENCY (N)	RELATIVE FREQUENCY (%)
Result		
Passed	47	94
Failed	3	6
Retest		
Passed	2	67
Failed	1	33

Table 5. Information regarding hearing health for families

CHARACTERIZATION (N 50)	ABSOLUTE FREQUENCY (N)	RELATIVE FREQUENCY (%)
Information regarding hearing health		
Yes	12	24
No	38	76
Professional who provide the information		
Doctor	5	10
Nurse	2	4
Speech-language therapist	4	8
Social worker	1	2
None	38	76

In terms of attendance at NHS, 92% were satisfied with the monitoring/assessment performed.

Regarding the follow-up at the high complexity unit, there was only one child who had left the neonatal ICU with a congenital malformation, who required hearing assessment due to having failed in the NHS. The diagnosis of this child was carried out after three months of age, by an otolaryngologist and a speech-language therapist. The procedure following diagnosis was to be discharged, after the third normal result of the PEATE. At the time of being discharged, the guardian responsible for the child received instructions regarding signs and symptoms of hearing loss and for normal development of hearing and language.

DISCUSSION

The objective of the present study was to analyze the UNHS flow at FHS Units using tracking and monitoring of children.

In the present study, the most prevalent risk factor was that of ICU leaver/premature (Table 1). This result was similar to that found by Pereira et al.[15], who observed 36% in their sample as being ICU leavers. Additionally, in the study by Pereira et al.[15], the association between hearing impairment and risk factors in public hospitals for pre-term newborns were: low weight/small size for gestational age, followed by ototoxicity and mechanical ventilation. The results obtained were also similar to another study[16] carried out in a secondary hospital, in which risks for pre-term infants were: ototoxicity, newborns with very low weight, mechanical ventilation and congenital infections. In newborns to term risk factors were: congenital infection, family history of hearing loss, newborns with very low weight, mechanical ventilation and asphyxia. In the assessment of Korres et al.[17], in a population of newborns of low and high risk for hearing impairment, the following were encountered: family history of hearing deficiency, congenital anomalies, ototoxicity, ventilation for more than 24 hours, prematurity and low weight.

In terms of the use of the psychotropic haloperidol, a Class C antipsychotic according to the classification of the United States' Food and Drug Administration (FDA)[18], only two studies regarding the use of the medication in animals are known of and these show adverse effects on fetuses, however there are no studies with pregnant women.

In terms of the antipsychotic and neuroleptic, levomepromazine, studies with animals show no teratogenic effects, effects however, that have yet to be studied in humans. Data that observes fetal cerebral effects of these prescription during pregnancy has still to be gathered. In newborns of mothers treated with elevated doses of neuroleptics, neurological problems and extrapyramidal problems are rarely observed. Consequently, the teratogenic risk, if it exists, seems to be small according to the instructions of the manufacturer of the medication.

Table 2 shows that 36% of pregnant women showed maternal alterations during pregnancy. According to the Health Care Guidelines for Children of the Municipality, UNHS[14], maternal complications can cause maternal and fetal complications, with such risks potentially leading to the need for ICU treatment and being associated with the risk of hearing impairment.

In terms of maternal alterations, studies carried out in India, in the city of Srinagar, by Magbool et al.[19], and by Wróbel et al.[20] in Poland, indicate the same factors predictive of risk of hearing impairments, such as: family history of hearing loss, intrauterine infections by toxoplasmosis, rubella, cytomegalovirus, Herpes – (TORCH) and Human Immunodeficiency Virus (HIV) infection, craniofacial anomalies, hyperbilirubinemia requiring exosanguineous transfusion, ototoxic medication, meningitis, low weight at birth, Apgar Index (birth conditions) below four in the first minute and less than six in the fifth minute, mechanical ventilation for more than five days, and syndromes associated with hearing loss. The results presented in Table 2, were similar to those of Korres et al.[17], who observed in a population of newborn individuals at low and high risk for hearing impairments, a family history of hearing impairment, congenital anomalies, ototoxicity, mechanical ventilation for more than 24 hours, prematurity and low weight. In terms of cytomegalovirus, in this case, altered maternal serology (antibodies) was observed, without causing congenital malformations, acting as a warning for serological monitoring of the newborn. Of the complications cited, only one with congenital anomaly of hydrocephalus resulted in failures in the UNHS.

In the assessments performed, all the mothers went for pre-natal check-ups, of which, 38% received attendance through a private clinic/health care plan. This result is similar to that observed by Hilu and Zeigelboim[21] in a questionnaire applied with mothers in a maternity hospital of the city. All of these carried out pre-natal check-ups, with 69% being at private clinics and 31% at public health care clinics. The results show receipt of information by pregnant women regarding the importance of monitoring and of the assessments carried out during the pre-natal period.

In terms of the realization of the NHS (Table 3), it was seen that 86% of neonates underwent screening. This result is similar to that of a study carried out in a maternity ward in the city of Marília, State of São Paulo[22]. It is also similar to other studies carried out in other countries/cities, such as Napoles in Italy[23], with reports of 75% coverage, in the State of New York, with 89% coverage[24] and in Soul, Korea, with 80% coverage[25].

In all the studies, indices are below the indicators cited in the Multi-Professional Committee for Hearing Health (COMUSA)[3], which suggests: coverage of NHS in at least 95% of newborns, with the aim of achieving 100%, and of the Health Care Guidelines for Children of the Municipality, which determine universal attendance for all newborns with realization of NHS within the first month of life of neonates, or up to the third months for infants (corrected age), taking into account premature babies and those with long periods of hospitalization[14]. The results in terms of the non-realization of the screening test showed failures in monitoring both in the Universal Health Care System (SUS) as well as in the private system.

Table 4 shows the results of the NHS during testing and retesting, in which 94% passed and three (6%) failed, going for retesting at the maternity ward. In a study carried out in Turkey[26], with 11,575 newborns, 74% passed in the first test and 25% failed. There was discontinuation of follow-up in 0.32% of

cases and during retesting 13% failed, corresponding to 1,575 of the total number. According to Musiek and Rintelmann[27], the fact that initial screening was conducted near to the time of hospital discharge, meant that there was no time available for the infant to undergo a second test under more favorable conditions. These include increase in maturity, better general health conditions and an absence of debris (adhesions) in the external acoustic meatus or transitory pathologies in the middle ear.

In the present assessment, only three required subsequent retesting, with two passing and one failing. The infant who failed, was an ICU leaver with congenital malformation of myelomeningocele with hydrocephalus, complications from meningitis and from a middle ear infection, needing to be sent for assessment at a high complexity hearing health service. Therefore, an index of less than 4% of neonates being sent for diagnosis in high complexity services according to the COMUSA procedure was observed.[3]

In terms of information and instructions regarding neonatal hearing health received by the families (Table 5), the results showed that 76% of the families did not receive information while 24% did. This was a proportion near to that observed by Hilu and Zeigelboim[21] in a questionnaire applied with mothers, at a maternity ward, in which 81% affirmed not having received information, while 19% reported having received information/instructions.

In an evaluation by Mazlan et al.[28] in Malaysia, a high level (95%) of satisfaction with the information received via explanatory literature, was observed. 38% however, were unsatisfied with the explanation and information provided by the testers and 26% believed that the information received during the realization of the universal testing program for neonatal hearing loss was insufficient.

In terms of study limitations, it was not possible to obtain the data for the medical occurrences detailed, a fact that made impossible correlations of age with IRDA. Similarly, there was an absence of information regarding the results of the exams in the high complexity unit and an absence of retrospective studies of the cases, which limited epidemiological monitoring.

The results generated indicate that there exists an integrated, organized and decentralized network for inter-sector management, with the identification and referral of neonates for more complex testing taking place. For the coverage/monitoring and follow-up of cases of hearing alterations, there exists a need for support for the families of counselling/contact and communication of information to this end. It is necessary to equip the ESF team in terms of care and referral for the realization of exams in specialized services in hearing impairment during infancy and for monitoring with the UNHS program. Similarly, an audit for hearing health should be undertaken.

In none of the cases was an active search by UBS for children who did not undergo the UNHS or have retesting by the maternity hospital, performed as determined by the Health Care Guidelines for Children of the Municipality[14]. There also exists a determination for active searching and adequate treatment in the National Neonatal Screening Program[9].

Monitoring by active search is required by services in the United States of America for neonates who received documentation for hearing loss[29].

Tracking, using active searching for children with or without IRDA is recommended, as a function of Primary Care, as well as the monitoring of cases identified with hearing impairments.

There is still a need to develop a databank compiling screening processes to monitor the monthly results obtained and that also serves as an instrument for tracking cases that were lost or where not all the steps necessary for retesting or diagnosis were realized, including access to information of high complexity services of cases referred to them.

According to the Early Hearing Detection and Intervention (EHDI) adopted by the Centers for Disease Control and Prevention – CDC[29] of the United States, there is universal access for all newborns to diagnostic testing and, depending on the results, a referral is made for testing services for permanent hearing loss. The statistical data of the tests is sent for analysis by the CDC.

CONCLUSION

The study shows the following conclusion: the attendance flow for UNHS is in agreement with the Health Care Guidelines for Children of the Municipality, however it is still not universal, since it does not reach the goal of 100% coverage for all neonates.

The analysis of the diagnostic process with the multi-professional team follows the norms and guidelines recommended for neonatal hearing screening with two accredited services for high complexity hearing care with attendance/assessment/treatment and provision of hearing prostheses and two hospitals for cochlear implant cases.

The hearing health strategies show that there is integration of care at the hospital and clinical levels, in the primary health care units under consideration and in the high complexity services in which clinical and hospital attendance is realized.

The data from this study reinforces the potential and importance of bringing together the ESF units in epidemiological monitoring of children who are submitted to the UNHS program in the municipality.

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Author contributions

JCS participated as the main researcher, developing the research, the timetable, survey of the literature, collection and analysis of data, and writing of the article; ABML participated as coauthor, developing the research, the timetable, writing the article; submission and review of the article.