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Main outcomes of a newborn hearing screening program in Belgium over six years

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ABSTRACT

Objective: To present the outcomes of the newborn hearing screening program in Belgium (French-speaking area) since its implementation and to analyze its evolution between 2007 and 2012 in the neonatal population without reported risk factors for hearing loss.
Methods: The study was descriptive and based on a retrospective analysis of six annual databases (2007–2012) from the newborn hearing screening program. The main outcomes were identified: prevalence of reported hearing impairment; coverage rates (first and second test, follow-up); proportions of conclusive screening tests; referral rate. Each outcome was presented for the six years and by year of birth. Chi-squares were used to study differences in the various outcomes according to time.
Results: Over the six years, 264,508 newborns were considered as eligible for the screening. Hearing impairment was confirmed in 1.41‰ ($n = 374$) of them, with significant disparities from year to year, between 0.67‰ and 1.94‰. Analysis of the screening process showed that only 92.71% ($n = 245,219$) of the eligible newborns underwent a first hearing test. This coverage rate varied greatly over time: at the beginning, less than 90% of the newborns had a first test and it rose to almost 95%. After the two screening steps, 2.40% ($n = 6340$) of the newborns were referred to an ENT doctor; the referral rate slightly decreased during the first years of the program and then stabilized around 2.4%. Over the period, only 62.21% of the referred newborns had a follow-up; the follow-up rate was particularly low for the first year (44.91%) and then strongly increased (+19.52% in 2008) but never exceeded 70%.
Conclusions: Outcome measures for the newborn hearing screening program in Belgium are lower than the benchmarks released by the Joint Committee on Infant Hearing. Nevertheless, the evolution of the outcome measures since the implementation of the program has been positive, particularly during the first years. At some point, most of the outcome measures decreased or at least did not change any further. The motivation and commitment of the professionals have to be supported in a variety of ways to improve outcome measures and thus, the quality of the program.

1. Introduction

European, American and international groups of experts have recommended the organization of universal newborn hearing screening (UNHS) for years [1–4]. The main purpose of a UNHS is to lower the age of hearing-impaired children at the time of diagnosis allowing earlier intervention. According to the Joint Committee on Infant Hearing (JCIH), comprehensive audiological assessment should be performed before 3 months of age, and appropriate intervention should begin before 6 months of age [2].

In the well-baby nursery population, prevalence of "significant bilateral hearing impairment" (HI), whose consequences are particularly severe for children's development, is 1–3 per thousand newborns [5]. However, UNHS programs aim to identify all kinds and degrees of HI among the bilateral or unilateral hearing-impaired newborns [2].

To assess UNHS programs, benchmarks and quality indicators have been released. The JCIH published the most frequently used benchmarks which are primarily related to the outcomes of the implemented UNHS programs, expressed as the minimum proportion of children who should be screened or who should be referred to

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an ENT doctor, or the proportion of duly followed up newborns, required to be considered as a high-quality program [2,5].

UNHS programs have been implemented in different countries or areas and a lot of reports and studies have been published about the organization, protocols, and main outcomes of the programs [6–10]. In Belgium, the Fédération Wallonie-Bruxelles (FWB) (French-speaking area) has implemented a UNHS program since 2007, in collaboration with maternity hospitals.

The objectives of this study were to present the outcomes of the UNHS in the FWB since the beginning of the program and to analyze its evolution between 2007 and 2012 in the neonatal population free of risk factors for hearing loss. Specific outcome measures of UNHS programs, especially those defined by the JCIH, were used to assess the quality of the program and its potential development. In the discussion section, outcomes from the UNHS program in the FWB were compared to those from other UNHS programs.

2. Methods

2.1. Study design

Study design was descriptive and based on a retrospective analysis of six annual databases (2007–2012) from the UNHS program in the FWB. The same data management was applied annually to each database, and after the closure of the annual reports no new or updated hearing results or diagnosis were added to the database.

2.2. Population

Around 55,000 children were born annually in the FWB. In 2007, the FWB contained 50 maternity hospitals; three maternity wards were closed in 2008, and one more in 2010.

2.3. UNHS protocol

Participation of the maternity hospitals in the UNHS program is on a voluntary basis. The UNHS protocol proposes different tests and organizations depending on the presence or the absence of risk factors for hearing loss [11]. This study focused on the newborns without reported risk factors for hearing loss, thus only this specific part of the protocol was presented. A two-step screening is planned: automated otoacoustic emissions (AOAE) are performed during the stay in the maternity ward. The first step is performed on day two or day three, and a second step is performed the following day in the event of a failed test ("refer") on one or both ears. If the refer result persists on one or both ears on the second step, children are referred to an ENT doctor for an audiological assessment within two weeks (Fig. 1). When the screening process is not finalized during the stay in the maternity hospital, parents are invited to have the procedures performed in an outpatient clinic, during the four weeks thereafter. Professionals performing the screening tests work either in the maternity ward (midwives, nurses or childcare assistants) or in the outpatient clinic (nurses, speech therapists or audiologists). Each hospital is free to designate the professionals in accordance with its local resources.

2.4. Devices

Each maternity hospital chooses its own screening device, provided that the protocol can be applied: the Madsen Accuscreen® was the most frequently used device during the study, but the Natus Echo-Screen® and the Otodynamics Echocheck® were also used (some hospitals have used the new version of the Madsen Accuscreen® since 2011). All devices use the default "pass-refer" algorithm.

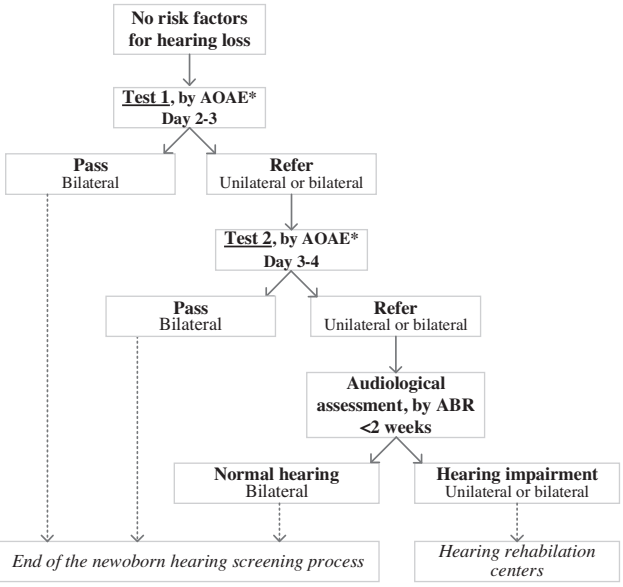

Fig. 1. Protocol of the newborn hearing screening program in the FWB, for the newborns without risk factors for hearing loss.

2.5. Data collection

At the beginning of the UNHS program, tests results were collected by the three neonatal blood screening centers in the FWB, and databases were sent annually to the coordinating agency for the UNHS program to monitor the program. Since 2011, computerized data collection based on the Internet has progressively replaced the initial system: screening results were transferred directly from devices to the central database, and results of the audiological assessments were directly typed in the database by the ENT doctors. Both systems still coexisted in 2012. The Internet database was managed by the coordinating agency and the neonatal blood screening centers did not participate in this system.

2.6. Inclusion and exclusion criteria

We included in this study children born between 1st of January 2007 and 31st of December 2012 in maternity hospitals participating in the UNHS program. However, due to the progressive recruitment of the hospitals in the UNHS program, we only included the children born in these specific maternity hospitals since the effective implementation of the program in these hospitals in this study.

We excluded newborns with risk factor for hearing loss: risk factors considered in the program[1] were based on the list from the JCIH (2000) [12] and adapted to the context and population in the FWB [11]. Risk factors were reported by professionals performing the screening tests, pediatricians, or ENT doctors.

[1] Family history of hereditary hearing loss; consanguinity (1st degree), in-utero infection (cytomegalovirus, toxoplasmosis, herpes, rubella, syphilis), poisoning (alcohol, drugs) by the mother during pregnancy, Apgar score of 0–6 at 5 min, gestational age <36 weeks and/or low birth weight (<1500 g), NICU admission for more than five days, exposure to ototoxic medications, hyperbilirubinemia at level requiring exchange transfusion, assisted ventilation lasting ≥24 h, head or neck anomalies and by extension each syndrome known to include a hearing loss, neurological or endocrine disease.