International Journal of Pediatric Otorhinolaryngology (2007) 71, 217–230

ELSEVIER

International Journal of Pediatric Otorhinolaryngology

www.elsevier.com/locate/ijporl

Comparison of universal newborn hearing screening programs in Illinois hospitals

Lia M. Ferro[a], Gail Tanner[b], Susan F. Erler[a], Kristine Erickson[a], Sumitrajit Dhar[a,c,*]

[a] *Department of Communication Sciences and Disorders, Northwestern University, Evanston, IL, United States*
[b] *Vision and Hearing Programs, Illinois Department of Public Health, United States*
[c] *Hugh Knowles Center, Department of Communication Sciences and Disorders, Northwestern University, Evanston, IL, United States*

Received 3 August 2006; received in revised form 6 October 2006; accepted 7 October 2006

KEYWORDS
Hearing;
Screening;
Newborn;
Universal

Summary

Summary/objectives: In accordance with the Joint Committee on Infant Hearing's (JCIH, 2000) position statement regarding Universal Newborn Hearing Screenings (UNHS), the state of Illinois enacted legislation requiring all birthing hospitals to conduct UNHS by 31 December 2002. Currently 100% of birthing facilities in the state of Illinois perform newborn infant hearing screenings using otoacoustic emissions (OAEs) and/or automated auditory brainstem response (AABR) measures. This study is an attempt to document current practices in hospital-based UNHS programs, as reported by program personnel, in the state of Illinois. The goal is to compare these reported practices to the recommended standards and identify factors that could lead to further refinement of the process.
Methods: A modified version of the Newborn Hearing Screening Survey from the Marion Downs National Center for Infant Hearing was used to gather practice- and protocol-related data for the 2004 calendar year via the World Wide Web. Data presented here are extracted from the online survey *as reported by hospital staff* presumably associated with the UNHS program.
Results: Fifty-nine of the 140 hospitals with UNHS programs responded to the Web-based survey. Nursing staff, followed by technicians, were most commonly reported to perform initial hearing screenings in both the well-baby nursery (WBN) and the neonatal intensive care unit (NICU). Audiologists appeared to participate in re-screenings at a greater number of the facilities. Automated ABR was the most common

* Corresponding author at: Department of Communication Sciences and Disorders, 2240 Campus Drive, Northwestern University, Evanston, IL 60208, United States. Tel.: +1 847 491 2470; fax: +1 847 491 2523.
E-mail address: s-dhar@northwestern.edu (S. Dhar).

0165-5876/$ – see front matter
doi:10.1016/j.ijporl.2006.10.004

screening tool (80%) followed by Distortion Product OAEs (32%) and Transient Evoked OAEs (5%). Eighty-six percent reported referral rates that were less than 5%, with 32% reporting a referral rate less than 1%.
Conclusions: At the beginning of 2004, 99% of all infants born in Illinois were being screened for hearing loss. Personnel involvement and screening measures employed were comparable to the few reports available from other states. The audiologist's role was found to be fairly limited in screening, re-screening, or managing UNHS programs. Referral rates were consistent with national standards (~1%). Management of UNHS programs in small, rural facilities, tracking/monitoring high-risk infants, and other services provided to families emerged as areas with room for improvement.

1. Introduction

Approximately 33 babies are born in the United States with a hearing loss every day [1,2]. Another three of every 1000 children born with normal hearing acquire a hearing loss during childhood or have an undiagnosed progressive hearing loss [1,3]. The goal of Universal Newborn Hearing Screening (UNHS) programs is to identify hearing loss as early in life as possible allowing the initiation of appropriate treatment and/or rehabilitation, thereby preventing the demonstrated educational, social, emotional and communicative consequences [4–7] of hearing loss. Prior to the inception of UNHS programs, the national average age of identification of childhood hearing loss was between 14 months and 2.5 years [8]. Such delays in diagnosis have been linked to irreversible delays and/or deficits in speech and language development [7,9] possibly leading to negative effects on literacy, academic ability, and social/emotional development [4]. Evidentiary support of the success of UNHS programs and appropriate early intervention comes from improved language abilities of children with hearing impairments [6,10] which are expected to translate into improved academic outcomes [4,6]; reduction in special education and training costs [6,10]; and ultimately to fulfilling employment and contributions to society [6,10,11].

The Joint Committee on Infant Hearing (JCIH) recommends a "1–3–6" plan: all infants, including those born in alternative birthing facilities, should be screened prior to 1 month of age, preferably before discharge [5,8]; diagnostics should be completed by 3 months of age for those referred after a re-screening [5,8]; and, for those with confirmed hearing loss, intervention should be initiated by 6 months of age [5,8]. Screenings need to be performed using objective physiologic measures that detect the presence of "permanent bilateral or unilateral, sensory or conductive hearing loss, averaging 30–40 dB or more in the frequency region important for speech recognition (approximately 500–4000 Hz)" [5, p. 800]. The JCIH also outlines suitable UNHS program personnel. An audiologist should be designated as manager of the program, with supervisory responsibilities for hearing screening as well as the design, implementation and evaluation of the program [5]. Personnel other than the audiologist performing the screenings may include nurses, speech-language pathologists, and others trained by an audiologist [5].

The above-mentioned initiatives at the national level have rapidly percolated to state level efforts. Currently in the United States, 38 states have some form of legislation that mandates UNHS. Cost effectiveness and efficacy of UNHS programs were questioned initially [7,12]. Although opponents were in favor of early identification, they argued for selective screening using a high-risk register, citing limitations of available equipment and program practices. It is important to acknowledge that high-risk infants represent only about 50% of infants with congenital hearing loss [7,13]. However, the cost of implementing and maintaining UNHS programs, the inability to detect atypical or progressive hearing loss, and noncompliance of families are pitfalls in UNHS that programs need to address [7].

Current universal screening practices are, indeed, ineffective in the identification of atypical hearing loss configurations and/or mild degrees of hearing loss. Automated auditory brainstem response (AABR) and otoacoustic emissions (OAE), used in current screening protocols, have the potential to miss low frequency hearing loss in infants with normal/near normal mid- to high-frequency hearing [12,14–16]. Borderline or mild hearing losses (thresholds between 15 and 25/30 dB) also may go undetected using current screening tools. Neonates often have vernix in their ear canals or transient fluid in the middle ear compromising the results of screenings and increasing false positive rates, particularly when using OAEs [14,15,17]. Those infants who may have progressive or late onset hearing loss would not be identified through newborn hearing