Trakia Journal of Sciences, Vol. 3, No. 1, pp 58-60, 2005

Available online at:
http://www.uni-sz.bg

ISSN 1312-1723

Original Contribution

THE COST OF COCHLEAR IMPLANTATION ON CHILDREN IN THE BULGARIAN HEALTH CARE SYSTEM

Petar Rouev[1]*, Valentin Stojanov[1], Ivan Tzenev[2]

[1]ENT Clinic, University Hospital Stara Zagora, Bulgaria
[2]ENT Dept., Medical University, Sofia, Bulgaria

ABSTRACT

PURPOSE: In our attempt to contribute to the idea of costing in healthcare delivery we aim to determine the costs of cochlear implantation (CI) on infants and children undergoing diagnoses and hospital stay under the aegis of the Universal Newborn Hearing Screening Programme (UNHSP).
METHODS: Under this programme, the charges for carrying out a UNHSP will have to be added to the resources for CI.
RESULTS: The cost per newborn for UNHSP only is 2.4 Euro/newborn and minimally 8.6 Euro/newborn inclusive of CI Programme.
CONCLUSIONS: The charges for carrying out a UNHS need to be added to the resources for CI. These funds should be provided after national programmes or through the National Health Insurance Organisation.

Key words: Universal Newborn Hearing Screening, cochlear implantation, hearing loss, health care, costs

INTRODUCTION

The early recognition of congenital deafness is one of the most important tasks for the modern audiologist. The diagnosing of children who need cochlear implantation (CI) starts with the initial universal newborn hearing screening. This is the only way children with congenital hearing loss could be found until their third month after birth; a diagnosing till the sixth month would be accomplished and an adequate hearing aid applied on time (1)

The idea of fitting hearing aid on children who will benefit from an eventual CI should be done after a period of at least 6-month's experience with this aid. This practically means that it should take at least a period of 9-12 months to arrive at the decision to carry out CI. Data from the American Academy of Paediatrics suggest that CI on children with hearing defects should be done before the end of the child's first year of life (2).

On this score we aim to determine the costs of this medical manoeuvre on members of this population under the aegis of the Universal Newborn Hearing Screening Programme.

MATERIALS AND METHODS

Our analysis was based on a prospective study carried out on 2000 newborn under the Universal Newborn Hearing Screening Programme (UNHSP) in Stara Zagora, Bulgaria, in the period spanning 11 months. The protocol consisted of an initial hearing screening test before discharge from hospital. This was then followed by a subsequent audiological definition on infants who failed the initial screening tests. The initial hearing screening was based on the information obtained from the auditory brainstem-evoked response at 35 nHL, using the automatic system ALGO 2 (*Natus Medical Inc., USA*). Newborns who failed this test were then re-examined by the same system 3-4 weeks later, at 40 and 70 nHL. A negative response then evoked an entire audiological examination, including ABR (Auditory Brainstem Response) audiometry and determination of

*Correspondence to: Peter Rouev, M.D., Ph.D.; ENT Clinic, University Hospital; 11 Armejska Str.; BG-6003 Stara Zagora; Bulgaria; Tel.: +359/42-2819356; Fax: +359/42-600705; E-mail: petar.rouev@web.de

hearing thresholds in a planned fashion. This last stage was done in an Audiological Centre of the ENT Clinic, along with the subsequent appraisal for a possible CI after a six months' period of adequate adjustment to a hearing aid. The candidates for a CI were eventually introduced to the CI team for a definitive decision.

RESULTS

A hospital that could handle 2,000 births annually and with a screening time of 8-20 hours per week was necessary. The optimal staff strength for carrying out the newborn hearing screening includes 2 or 3 nurses, one ENT specialist and one audiologist. The time necessary for the examination of a newborn was less than 5 minutes in 90% of the children. A failed test in this initial screening resulted in re-examination 3-4 weeks later. Failure in this second test made it mandatory that a complete audiological assessment be carried out at an ENT clinic. The summed time in which the personnel will be engaged amounts to 350 hours per year.

Table 1. Time per year for screening 2000 newborn babies.

Number of screened newborn	Time for one screen test	Summed time
1,800 (90% - PASS on first stage)	1-5 min.	250 hours
200 (10% - REFER after first stage)	5-60 min.	200 hours
Summary – 2000 newborn		350 hours

According to the global charges accepted for the Republic of Bulgaria on Sep. 1, 2003 we could estimate the expenses per year in detail as follows:

- Charges for a salary and social insurance for the medical staff (an audiologist + otorhinolaryngologist + 2 nurses) 350 hours per year – 1,380 Euro.
- Charges for an annual technical upkeep of the apparatuses that are used – at about 767 Euro.
- Wear and tear costs (in case of 10,225 Euro price for the medical installations) – 2,045 Euro (rate 20%).
- A charge for working premises at about 20 m² (electricity, water, rent, security and others) annually – 409 Euro.
- Others annual charges – 205 Euro.

With these in view, it is obvious that the minimal expenses for the screening examination of 2,000 newborns are 4,806 Euro per year (2.4 Euro/ child). With a minimal Bulgarian birth rate of 65,000 per year and the necessity for CI is at least 27 per year, the cost of CI programme is minimally 391,500 Euro per year (minimally 8.6 Euro for each affected newborn).

DISCUSSION

According to West European standards the cost for CI itself comes to about 20,500 Euro, and about 7 Euro is spent for UNHSP for a newborn (3). In Bulgaria the cost of CI is about 14,500 Euro. Our opinion is that the price of the UNHSP should also be added to the value of the CI. According to Gorga et al (2001), the cost of the UNHSP includes not only the price of the examination of the newborns in the hospital, but also that of the cost of the children who have failed after the UNHSP for the period of one year (4). The total value of the UNHSP includes cost of equipment, personnel cost and subsequent examinations.

Every single screening programme has its own prime cost. The screening programmes are based on three types of screening protocols: auditory brainstem response audiometry (ABR) independently, oto-acoustic emissions (OAE) independently, and oto-acoustic emissions followed by auditory brainstem response audiometry. According to Iley and Addis, adopting the automatic ABR as an initial screening method is more practical and cheaper compared to the method of TEOAE (5). If we take into consideration the subsequent examinations we find that the two-stage hearing screening (OAE, ABR) is the more advantageous one. Furthermore we should bear in mind that only 1/3 of the candidates for CI undergoes electro-stimulation and only 1/4 of them reach a CI decision (6) and this affects the total cost of the CI as a whole.

Good result after the CI is expected among infant and small children if it is done during the first year of life (7). After timely implantation and an appropriate auditory and speech rehabilitation it is possible for the implanted children to attend ordinary children's gardens and later graduate from normal schools (cases of children with multiple disorders are excluded). The aim is children with implants to possess speech development, comparable to that of children

with normal hearing. This lessens the social weight on society.

In conclusion we state the following:

- The charges for carrying out an UNHS need to be added to the resources for CI.
- These funds should be provided after national programmes or through the National Health Insurance Organization
- The cost per newborn for only UNHSP is 2.4 Euro/newborn and minimally 8.6 Euro/newborn inclusive of CI Programme.

REFERENCES

1. National Institutes of Health Consensus Statement: Early identification of hearing impairment in infants and young children, *National Institutes of Health Consensus Development Conference Statement* 11:1-24, 1993.
2. American Academy of Paediatrics, Newborn and Infant Hearing Loss: Detection and Intervention. *Paediatrics,* 103(2):527-30, 1999.
3. White KR, Maxon AB, *Implementing Universal Newborn Hearing Screening Programs*, NCHAM Utah State University, USA, p. 23, 2000.
4. Gorga MP, Preissler K, Simmons J, Walker L, Hoover B, Some issues relevant to establishing a universal newborn hearing screening program. *J Am Acad Audiol,* 12(2):101-12, 2001.
5. Iley KL, Addis RJ, Impact of technology choice on service provision for universal newborn hearing screening within a busy district hospital. *J Perinatol,* 20(8 Pt 2):S122-7, 2000.
6. Baumgartner WD, Gstoettner W, Hamzavi J, Adulka O, Czerny C, Praeoperative Diagnostik vor einer Cochlear-Implantation. *Wien Klin Wochenschr,* 112(11):505-8, 2000.
7. Yoshinaga-Itano C, Coulter D, Thomson V, The Colorado Newborn Hearing Screening Project: effects on speech and language development for children with hearing loss. *J Perinatol,* 20(8 Pt 2):S132-7, 2000.