

Guidelines to Establish a Hospital Based Neonatal Hearing Screening Program in the Indian Setting

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Abstract

The challenges to implement universal neonatal hearing screening (UNHS) in India are limited funding, manpower shortages, inadequate support services, low public awareness and uncertainty regarding commitment from health care practitioners. Nevertheless there are isolated groups in India who have been implementing UNHS. St. John's Medical College Hospital, Bangalore has been implementing UNHS since September 2002. Till date we have screened 5100 neonates. In this article we detail the steps we followed to establish the program and make it a standard of care in our hospital. A qualitative design is used to describe every stage. A team consisting of faculty from Neonatology, Audiology and speech Pathology, Otorhinolaryngology, Child psychology and Medico-Social work constituted the screening team. Due to a high birth rate the strategy we followed was as follows. All infants not at risk were screened by behavioural audiometry using 60 and 70 dB warbled tones. The infants at risk were screened by a two stage otoacoustic emissions (OAE) screening as well as behavioural audiometry. As a safeguard against false negatives of our strategy all the infants irrespective of the results were given a language and hearing milestone chart for parents to report if the age appropriate milestone was absent. Screening in the NICU caused a lot of referrals so it is best avoided. If a sound proof room is available adjacent to the NICU it would be ideal. In our experience a pilot program should be run for at least one year to get an idea of the inputs required as well as aid in formulating a screening strategy. At regular intervals an audit should be conducted and the data published in indexed journals so that others who want to start UNHSP can benefit. Also a national dataset should be collated based on these data to guide institutions to initiate similar programs so that not a single hearing impaired child in this country is neglected.

Key words: Neonatal hearing, Screening program, Behavioral audiometry.

The 2007 statement of Joint committee on Infant Hearing (JCIH, 2007), American Academy of Pediatrics states that every state in the United States of America has a Universal Neonatal Hearing Screening Program (UNHSP) and 95 % of the new borns are screened before discharge from the hospital.(JCIH , 2007).In India we have a long way to go before we can reach this goal. Limited funding, manpower shortages, inadequate support services, low public awareness and uncertainty regarding commitment from health care practitioners are the challenges in a developing nation like India.(Olusanya BO et al, 2004).Nevertheless there are isolated groups in

India who have been implementing UNHS. (Nagapoornima et al 2007 ; Malik M et al 2007 , Mathur NN et al , 2007). St. John's Medical College Hospital, Bangalore has been implementing UNHS since September 2002. Till date we have screened 5100 neonates. We have published our work in a Pub Med/Medline indexed journal and cited an incidence of 5.6 hearing impaired neonates per 1000 screened.(Nagapoornima et al 2007).This article details the steps we followed to establish the program. Also discussed is the logistics of running the program so that it is an established standard of care in our hospital. This information can be used by other hospitals to adapt these guidelines and

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implement UNHS.

The UNHSP at our hospital commenced on September 1, 2002. It has been functional for the last 6 years. The description of the work has been examined in four major steps.

1. Establishing a case for UNHSP.
2. Building a UNHS team.
3. Initial pilot run for 2 years.
4. Establishing a full fledged UNHSP.

A qualitative design is used to describe every stage. We start every stage with description of the technique followed by us and the limitations of the technique. The results are discussed in the light of the JCIH, AAP, 2007 statement which comprehensively summarises the state of UNHSP around the world. We have concluded by putting forth guidelines which could be adopted by various hospital based institutions.

Creating a case for UNHS

On January, 2002 a seminar was organized at our hospital to review the state of pediatric audiology in India. Faculty from the specialties of Pediatrics, Audiology and Speech Pathology, Otolaryngology, Child Psychology, Community medicine and Medicosocial work participated in the seminar. At the end of deliberations it was felt that the incidence of hearing impairment from

would be practical to run a pilot program for 2 years using a hired Otoacoustic emission (OAE) screener. Accordingly a proposal was drawn up and placed before the management for approval. On July, 2002 the executive council of the institute granted permission to start UNHS using a hired OAE screener from SRC Institute of Speech and Hearing, Bangalore.

Building a team

On August, 2002 a meeting of the faculty members who volunteered to participate in UNHSP was convened. The following speciality members formed the team. Neonatology, Audiology and Speech Pathology, Otorhinolaryngology, Child Psychology and Medico-Social work. At the end of the meeting each team member's job description was defined.

Neonatologist

- Counsel parents for hearing screening and take consent.

Otolaryngologist

- Examines the external auditory canal for any abnormalities that may cause a false positive result on OAE Screening.

Audiologist and Speech Pathologist:

- Performs OAE screening and Auditory Brainstem Response (ABR) as per the protocol shown in figure 1.

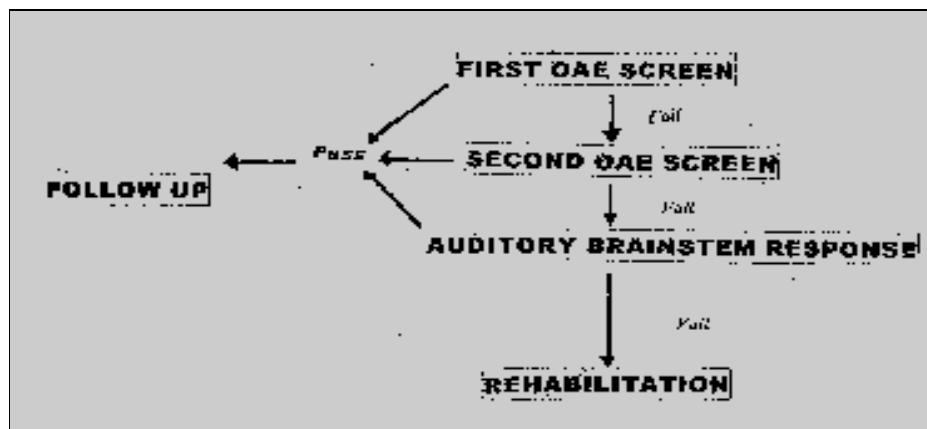


Figure 1: Protocol used to screen for hearing impairment in neonates at St John's Medical College, Bangalore

Indian and western literature warrants commencement of UNHS in our hospital. One faculty member from each speciality volunteered to participate in the program if it was established. There was a consensus to write up a proposal for submission to the hospital management. We felt it

- Follows up the screening passed, not at risk infants at 1 year of age and at risk infant at 6 months and 1 year of age. Receptive expressive emergent language scale (REELS) was the tool used to assess age appropriate language development.

- Arranges for appropriate rehabilitation of hearing impaired infants.

Child Psychologist

- For grief counseling and preparing the parents to be active partners if rehabilitation is required.

Medicosocial worker

- Ensuring adequate follow up of the infants and contact infants who miss the appointment.

It is crucial to ensure that each member chose to be part of the team. This made managing the work responsibilities easy. There was no extra incentive for the additional work that was taken up by each member.

Establishing a pilot run

The logistics of establishing a pilot program at our hospital were the following:

- Signing of a memorandum of agreement with SRC Institute of Speech and Hearing to hire their OAE screener and staff for 2 hours a week. A charge of Rs. 110 was levied for two OAE screens. St. John's Hospital collected the amount and reimbursed to SRC Institute on a monthly basis.
- Neonates in the NICU who were at risk based on the JCIH, 2000 were screened. Screening was done in the NICU for one year. As the number of referrals for second screen was very high, due to unacceptable noise levels in the NICU, after one year we shifted the venue of screening to ENT OPD. The referrals for second OAE screen reduced considerably after this but we missed a lot of babies to follow up.
- We followed a screening protocol adapted from JCIH, 2000. Our strategy consisted of a two tiered OAE screen. The first screen was completed by 6 weeks of birth and the second screen by 3 weeks if the first screen failed.
- For a period of 6 months a hand held screener donated by Voita Institute, Germany was used to screen not at risk infants.
- The data recording details are described as a separate subheading.

At the end of the pilot program for 2 years, the data was presented to the management team consisting of the hospital administrator and heads of the departments involved in the program. The issue of purchasing an OAE screener for the hospital was discussed at the executive council meeting. Partial funding was promised by Christoffel Blinden Mission (CBM), a charitable funding agency. On July 2004, the administration approved purchase of ILO USB – I, OAE analyzer. From January 2005, we commenced universal hearing of all infants seeking care at our hospital.

Implementation of universal neonatal hearing screening

The logistics of the program in our hospital is as follows:

- The protocol for screening was altered because we could not do OAE testing of all the neonates. All not at risk infants were screened by behavioural audiometry using 60 and 70 dB warbled tones. Behavioural response index was used to standardize the response. The at-risk infants were screened by OAE as well as BOA. All the at risk infants who passed were followed up at 6 months and one year to examine for age appropriate hearing and language milestones. Infants who had disability were rehabilitated. Children with multiple disabilities were asked to follow up on Wednesdays where a multispeciality rehabilitation team provided a single window service for physical, mental, visual and hearing disability. This service called the Unit of Hope provides highly subsidized care for children with multiple disabilities. Hearing aids are procured directly from the company and provided at a much lower cost than maximum retail price (MRP).
- Every 6 months an internal audit was conducted by the person co-ordinating the program to evaluate the performance and compare it with JCIH 2000, recommended parameters.
- All the data was collected and published in a Pub Med indexed journal in 2007 for the benefit of other groups in India, wanting to start similar programs.

Data recording

Initially from 2002 to 2004 all the data was recorded in a proforma (Appendix – 1) over a 2 year period. At the end of two years we realized

that the records were occupying a large amount of space. To reduce this we made a register with all the details printed in columns.

By this method we reduced the space requirement by 90 %. The alpha numeric data was coded and entered in another register. This was entered in MS – Excel spread sheets in the computer. Statistical package for social sciences version 15 (SPSS) was used to perform statistical analysis.

Establishing a hospital based universal neonatal hearing screening program – Lessons learnt from St. John's program.

The absence of any data on sensitivity and specificity of OAE data in the Indian setting was a major handicap in the initial stages of establishing our program. Studies from the European and American programs were used to formulate our initial strategies for screening. Our stumbling block was the large number of neonates to be screened due to a high delivery rate. The western UNHSP did not have this scenario. We altered our strategy of screening in the NICU to screening at first visit or before discharge. Also we screened not at risk neonates by behavioural audiometry to cope up with high delivery rate. To avoid missing out on false negative screens and delayed onset hearing loss, we adopted a strategy to follow up at 6 months and one year.

Our learning regarding data management was that custom made registers were more easy to maintain and occupied lesser space compared to proforma sheets. Regarding follow up of screened neonates we discovered that about 60 % of our screened neonates were lost to follow up. This rate, especially in the at-risk failed neonates is alarming. Even in American screening programs loss to follow up is upto 50 % in some centers. We are in the process of improving on our follow up rates by employing a person exclusively to ensure follow up. Another measure we have incorporated is to give a follow up card to the mother which will outline the main milestones of hearing development. This we intend will aid in adequate follow up and detection of late onset hearing loss.

Universal neonatal hearing screening initiatives in India – Need to publish in indexed journals.

UNHSP is in its embryo stage in India. A Pub Med search using the key words “infant / neonatal hearing screening in India” revealed only 11 articles. In 1990, a major initiative was undertaken

to review the state of pediatric audiology in India during a workshop conducted by All India Institute of Medical Sciences, New Delhi. The workshop highlighted the findings of a large scale multicenter survey conducted with the support of Indian Council of Medical Research (ICMR) as well as work of other researchers involved in pediatric audiology. Following this there were no published reports till 2002. Since 2002 there have been isolated small scale observational studies. In 2002 a national consensus building workshop was organized at All India Institute of Speech and Hearing, Mysore to frame guidelines to establish a national program for early detection and rehabilitation of hearing impairment. Following this there has been a report of normative data for TEOAE in Indian children. The year 2007, saw two reports of large scale screening exercises in indexed literature. The report from New Delhi discussed strategy of screening after 6 weeks to reduce referrals. A report from Bangalore, examined the incidence data in a large neonatal population.

Though some groups in Chennai and Trivandrum and Mumbai have been involved in neonatal screening there is no published reports from these centres. All the groups involved in this work should publish their data so that a database can be created for India. This will assist future program to benefit from the experience of these groups.

Conclusions

We have put forth the following guidelines for tertiary care hospitals in the non governmental sector who wish to start UNHSP.

1. A team consisting of faculty from Neonatology, Audiology and speech Pathology, Otorhinolaryngology, Child psychology and Medico-Social work should be constituted. Each member should choose to contribute to the program. The job description of each member should be defined at the outset.
2. A pilot program for at least one year will give an idea of the inputs required from the management as well as help in formulating a screening strategy.
3. A two stage OAE screen with first screen at the first follow up visit to the hospital is more effective for at risk infants. Screening in the

NICU causes a lot of referrals so it is best avoided as a venue for screening. If a sound proof room is available adjacent to the NICU it would be ideal.

4. At the outset of the program a dataset should be formulated. A hard copy as well as soft copy of the data should be created and regularly updated. A register with columns for all the details and rows for each case is more space efficient compared to proformas.
5. At regular intervals an audit should be conducted and the data published in indexed journals so that others who want to start UNHSP can benefit. Also a national dataset can be collated based on these data.

References

- Joint committee on infant hearing screening (2007) Position statement. *Pediatrics Vol 120* (4), 898 – 921.
- Malik, M., Pradhan, S.K, Prasana, J.G, (2007). Screening for psychosocial development among infants in an urban slum of Delhi. *Indian J Pediatr*, 74 (9), 841 – 5.
- Mathur, N.N, Dhawan.R (2007). An alternative strategy for universal infant hearing screening in tertiary hospitals with a high delivery rate within a developing country using transient evoked otoacoustic emissions and brainstem evoked response audiometry. *The Journal of Laryng and Otol*, 121, 639 – 643.
- Nagapoornima,M., Ramesh,A., Srilakshmi,V., Suman Rao P. N, Patricia P L, Madhuri Gore, Dominic M, Swarnarekha (2007). Universal hearing screening . *Indian Journal of Pediatrics*, 74(6), 545 – 549.
- Olusanya BO, Luxon LM, Wirz SL (2004) Benefits and challenges of new born hearing screening for developing countries. *Int J Pediatr Otolaryngol*. 68(3), 287 – 305.

Annexure 1

Dataset of St John's Neonatal Hearing Screening Program

Name :	Sex :	DOB :
Duration of NICU stay :		
Number Neonatal :		Birth weight :
		Gestation :
Hospital :		
Address :		Phone number :

Risk factors :

1. Hereditary hearing loss :

2. Ear deformities :

3. Hypoxic ischaemic encephalopathy : Y/N

APGAR: 5 mts - 10 mts- Bag Mask Ventilation : Y/N Endotracheal and ventilation : Y/N

4. Duration of Medications - Genatmycin : Amikacin : Furosemide :
other ototoxic medications :

5. Infection : Sepsis - Y/N Meningitis : Y/N

6. Hyperbilirubinemia: Peak level : Duration: Phototherapy: Y/N Exchange Transfusion: Y/N

7. Pre term : Y/N LBW : Y/N SFD/IUGR: Y/N

<u>Method used to screen</u>	<u>Date</u>	<u>Result</u>
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OAE : First screen

: Second screen

BOA

ABR

Maternal Problems

Natal History

Delivery : Home / Hospital

: Normal/Breech/Caesarean/Forceps

Family History

Type of family : Nuclear/Joint :

Consanguinous marriage :

Literacy of : Father

: Mother