# Setting the standard for newborn hearing screening

The parents of newborn babies in England are offered the opportunity to have their child's hearing screened shortly after birth as part of the NHS Newborn Hearing Screening Programme. This has had a significant impact on the life chances of those children identified. The challenge now lies in ensuring the highest quality standards – in screening, assessment, support and intervention – to improve outcomes for every deaf child and their family.

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#### Key points

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- 1. Most babies with a hearing loss are born to families with no history of deafness.
- Prior to the implementation of the NHSP, half of the children with a significant hearing impairment were not identified until they were one and a half years old, with a quarter not identified until three and a half years of age.
- Such late identification of hearing impairment not only delays the timely provision of information and support but has also led to a lifetime of underachievement for deaf children – educationally, socially and economically.
- 4. The research project 'Positive Support in the lives of deaf children and their families' aims to understand more clearly the link between outcomes and what happens with the deaf children and their families after identification of deafness.

The NHS Newborn Hearing Screening Programme (NHSP) has recently reached a momentous milestone with two million babies now having been screened as part of the programme (FIGURE 1). Recognised as the most advanced hearing screening programme in the world, more than 3,400 babies have now been identified as having some level of permanent hearing impairment or deafness as part of the programme.

Early identification through the NHSP has made a significant impact and enabled children and families to benefit from:

- Earlier provision of amplification which enables babies to experience sound early
- The opportunity to develop language and communication skills at a pace similar to that of hearing children
- Early advice and support for families to enable them to communicate well with their baby
- Early information to support families' informed decision making
- n The opportunity to access the right support at the right time for both the baby and the family.

From March 2006, parents of all newborn babies in England have been offered the opportunity to have their child's hearing screened shortly after birth. About 1,700 babies are now screened every day as part of the NHS Newborn Hearing Screening Programme. For services, there has been significant development activity undertaken by health, education and social care professionals in direct response to the NHSP and it has been cited by an independent evaluation as being a major catalyst for improvement in provision of paediatric audiology, education and social care for children with permanent childhood hearing impairment (PCHI)<sup>1</sup>.

#### Background

Following a Health and Technology<sup>2</sup> report commissioned by the Department of Health, the NHSP was developed to replace the previous universal hearing screen (the Health Visitor Distraction Test) that used a behavioural test at around eight months of age. The advent of simple to use hearing screening technology has made it feasible to introduce a family friendly screen for hearing loss for all newborn babies.

At least one in every 842 babies born in the UK will have a permanent childhood hearing impairment that can significantly affect their language and social development. This figure increases to about three in every 1000 babies who have spent more than 48 hours in intensive care.



FIGURE 1 Javaine Cranston, born 3.24am on Sunday 9th September at St George's Hospital in Tooting, was the two millionth baby screened by the NHS Newborn Hearing Screening Programme. Javaine's mother Chervaine said: "Javaine was born early Sunday morning and had the hearing test that afternoon. I found it reassuring that the test could be carried out so quickly – it was all very easy and he slept through it all."

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Most babies with a hearing loss are born to families which have no history of deafness. Prior to the implementation of the NHSP, half of the children with a significant hearing impairment were not identified until they were one and a half years old, with a quarter not identified until three and a half years of age.

Such late identification of hearing impairment not only delays the timely provision of information and support but has also led to a lifetime of underachievement for deaf children educationally, socially and economically.

There are several known risk factors for PCHI. The main two are:

n admission to a neonatal intensive care unit (NICU) for at least 48 hours

n a family history of PCHI.

In order to reduce the age of identification, targeted newborn hearing screening for babies at risk of having, or developing, hearing loss was introduced in many areas. In many cases, however, there is no known risk factor associated with the hearing loss and therefore yields from targeted newborn hearing screening programmes were limited.



appropriate

assessment at appropriate age

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Studies from the University of Colorado and the Colorado Home Intervention Programme for children with hearing impairments show significant benefit of early identification and intervention in terms of language and communication development when PCHI is identified, and an intervention programme started, before six months of age<sup>3</sup>.

#### **Maternal anxiety**

Before the introduction of universal hearing screening there was some concern that such early identification of childhood hearing loss could lead to unacceptably high levels of maternal anxiety. As part of the evaluation of the first phase of NHSP implementation in England, Crockett et al<sup>4</sup> showed that although mean anxiety levels recorded by mothers was in the normal range, anxiety did increase with the number of screening tests carried out.

Those mothers who avoided this rise in anxiety were those who best understood that not getting clear responses from the screen was unlikely to mean that their child actually had a hearing loss. The way that the screening process, and especially screen referrals, is communicated to parents by screeners, is therefore extremely important and NHSP has developed training to ensure that parent-screener interactions are of a high quality.

#### The NHSP delivery across England

The process for delivery of the NHSP and associated timescales may differ depending upon the NHSP model used and whether the baby has spent more that 48 hours in a NICU or special care baby unit (SCBU).

There are 121 local NHSP services across England. Seventy five percent of these services are hospital-based where the aim is to fully screen the babies prior to their discharge, or in an outpatient clinic for babies 'missed' or not born in hospital. Screening in these services is carried out by specially trained newborn hearing screeners.

Twenty five percent of services are community-based where the aim is to screen babies in their own home at about 10 days of age. Screening in the home is usually carried out by specially trained health visitors.

In both service delivery models, babies who have spent more than 48 hours in a NICU or SCBU will have their hearing screened before they are discharged from hospital. These babies are screened using the NHSP NICU/SCBU protocol. Babies who have NOT spent more than 48 hours in a NICU or SCBU are screened using the NHSP well baby protocol (**FIGURES 2-4**).

These care pathways, with all supporting information and references, are available to registered users on the Map of Medicine website (www.mapofmedicine.com).

### Hearing screening methods used in the NHSP

Two screening methods may be used: Automated Otoacoustic Emission (AOAE) and Automated Auditory Brainstem Response (AABR). AOAE and AABR screening provides the right combination of sensitivity, speed and efficiency. Both AOAE and AABR screening methods are non-invasive and screening is best carried out while the baby is in natural sleep or settled.

The Automated Otoacoustic Emission (AOAE) screening test involves placing a small, soft tipped earpiece in the baby's outer ear; soft 'clicking' sounds are then played (FIGURE 5). When a hearing ear receives sound the cochlea produces a sound in response which can be picked up by a tiny microphone in the earpiece. The AOAE screen only takes a few minutes. It is sensitive to baby and environmental noise so needs to be carried out in





FIGURE 5 Infant undergoing the AOAE hearing screening test.

reasonably quiet conditions.

The Automated Auditory Brainstem Response (AABR) involves the placement of three sensors: one on the baby's high forehead, one on the nape of the neck and one on the shoulder. Soft headphones, specially made for babies, are placed over the baby's ears and a series of 'clicking' sounds played. The baby's response to sound, from the auditory nerve, is picked up via the three sensors. AABR screening can take between five and 30 minutes and is very sensitive to baby movement, so the baby needs to be asleep or very settled.

#### Hearing screening for NICU babies

Babies who have spent more than 48 hours in NICU or SCBU, irrespective of why they were admitted to the unit, will have their hearing screened before they are discharged from hospital using the NHSP NICU/SCBU protocol. These babies are screened using both the AOAE and AABR screening methods. (Well babies are only screened using AABR if no clear responses have been obtained from AOAE screening).

NICU/SCBU babies are screened when they are over 34 weeks' gestational age and medical advice considers them well enough – ideally as close as possible to their discharge from hospital.

If clear responses are obtained from both of a baby's ears it is unlikely that they have a hearing loss, however, it is important that any parental or professional concerns are acted upon. Parents are given two checklists showing what they can expect from their baby in response to sound and the sort of sounds their baby should make as they grow older. Parents of NICU/ SCBU babies may require further advice regarding the use of these checklists in relation to their baby's gestational age and development.

A 'no clear response' outcome from a newborn hearing screen does not necessarily mean the baby has a hearing loss as there are a number of reasons why the screener may be unable to record clear responses. These include too much background noise, an unsettled baby or fluid remaining in the ears after birth. It should be remembered, however, that babies who have spent more than 48 hours in intensive care are at greater risk of hearing loss.

The decision to refer a NICU/SCBU baby for full audiological assessment, during the newborn period, is based on the AABR screen outcome.

NICU/SCBU babies have the AOAE screen to try to identify mild and potentially progressive hearing loss in this very vulnerable group of individuals. Therefore if no clear responses are recorded from either of a baby's ear from the AOAE screen they are referred for a targeted audiological follow up at eight months of age.

All babies referred from the newborn

hearing screening programme should be seen for a full audiological assessment within four weeks of screen completion.

#### Using technology in NHSP

At the heart of the NHSP is a national information system called eSP (eScreener Plus). This innovative system has been acknowledged as one of the most successful clinical systems in the NHS. eSP is used by every local hearing screening programme in England for management and audit. It was the first national clinical system to be rolled out over the secure NHSnet network and the first to link to NN4B (NHS Numbers for Babies) to receive electronic birth notifications. It is also used by the Scottish newborn hearing screening service. eSP went live in England at the start of 2003 and its development continues with new releases on a regular basis. Data collected by eSP is analysed and reported on to support the quality assurance activity and all services are provided with regular information about their local progress towards meeting the NHSP Quality Standards.

With ever increasing demands on time, and financial constraints within NHS training budgets, NHSP has concentrated on developing e-Learning opportunities to overcome these barriers to access. The first module was launched in March 2007 and is firmly embedded in an assessment and mentoring framework. Its aim is to provide training for newly recruited NHSP screeners and to provide an up-to-date resource for existing, trained, NHSP screeners.

This approach enables NHSP to ensure screener competence and implement a focused and up-to-date resource which will adapt with the evolution of new technology, evidence and clinical practice. After new screeners have completed the e-Learning module they attend a one-day session run by the programme centre. The morning provides training and discussions on communication with parents and the afternoon is the OSCE (Observed Structured Clinical Examination) which is used to ensure competence for screening.

Further e-Learning opportunities are being actively explored and developed including NHSP information modules for GPs, Health Visitors and Midwives. These will incorporate Early Support\* training materials for professionals involved with families at the time of confirmation and follow-up in the

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diagnostic period and early months of support (\*Early Support is the central Government's mechanism for improving co-ordination of service delivery for disabled children and their families).

## NHSP parent information and standards

NHSP has led to a move away from a system where identification of childhood deafness is driven by parents.

"This shift is a significant change from when parents had time to become suspicious of their children's hearing status and act on it. Instead, parents are now being acted on by the medical, professional and public health systems"<sup>5</sup>.

The provision of high quality information and support for parents to guide them through the care pathway is therefore vital. During pregnancy all parents are provided with written information on newborn hearing screening in the form of a 64 page booklet 'Screening tests for you and your baby'. This was developed with the UK National Screening Committee to enable informed decision making for parents with regard to antenatal and newborn screening.

NHSP values the views of families and it has actively sought to involve parents in its work via a number of initiatives. A parents' consultation was commissioned in 2006 to establish parents' views on consent and information issues in relation to the newborn hearing screen and materials were updated to reflect, and take into account, opinions expressed.

To promote best practice and seamless services for families the NHSP has targets, national protocols and guidance that span the entire patient care pathway: Antenatal information; Screening process; Audiological Assessment; Medical; Surveillance; Early Years Educational and Social Care support.

The quality of the NHSP is governed within a risk management framework that encompasses a quality assurance programme and risk management activity. The framework supports services in striving to achieve the highest possible standards of care for deaf children and their families across England. It does this by working in partnership with service managers in Health, Education and Social Care, local Trusts, Public Health, commissioners, private and voluntary sectors.

#### Family friendly working

Central to the ethos of the NHSP is the concept of family friendly practice. NHSP, partly through its training and consultancy initiative, helps ensure positive experiences for families by:

- n Setting high standards of quality service delivery
- n Supporting professionals in the development and delivery of child and familycentred services
- n Offering practical solutions, training and support to services and multidisciplinary teams nationwide.

NHSP is continually seeking to improve its service to families and to achieve excellence in its provision from early identification of deafness through diagnosis to rehabilitation.

Having consulted with parents, the NHSP wished to give primary users of paediatric audiology services – deaf children, the opportunity to have their say about different aspects of hospital-based audiology clinics and priorities for improvement. The NHSP commissioned a Children's Consultation with 23 deaf children aged 7-13 years from six different London schools. Signed support and BSL interpretation was provided throughout the day. The children were particularly positive about the choice and range of ear mould colours and designs enabling them to effectively customise their hearing aids.

Many had good things to say about their audiologist in terms of the way they were treated and communicated with. Some children felt there was room for improvement, particularly with regard to long waiting times, dull waiting areas and being given information directly from their audiologist, rather than getting information via their parents.

## Positive support in the lives of deaf children and their families

It is of crucial importance to families of deaf children, service providers and policy makers to understand the effectiveness of different types of support and intervention in helping children, families and society to improve outcomes and reduce the social and economic exclusion of deaf children. However, the evidence to make inferences about the effectiveness of the type, extent and quality of intervention is currently insufficient, with a lack of good quality data.

The introduction of the NHSP has

given rise to significantly earlier identification of deaf children than previously, with most now identified significantly below six months of age. Previously published research on outcomes in deaf children has indicated significant deficits in language, communication and literacy that impacts upon other activities and upon social inclusion.

The new service developments make this an extremely opportune time to carry out a longitudinal study of the first cohorts of children to be identified by the Newborn Hearing Screening Programme. Researchers from the University of Manchester and University College London together with Deafness Research UK and NDCS were funded by the Big Lottery Fund in 2005 to gather data on outcomes and on the variables likely to affect them, including detailed measures of intervention.

The aim of the research is to understand more clearly the link between outcomes and what happens with the deaf children and their families after identification of deafness. The project is called '*Positive Support in the lives of deaf children and their families*' and is funded initially until 2008. Applications to extend the study towards school entry age are now being made, which will enable further consolidation of findings to inform parents and service providers to help them get the best possible outcomes for deaf children and their families in the future.

For up to date information about newborn hearing screening please refer to the website at http://hearing.screening.nhs.uk

#### References

- Bamford J. et al (2005) Evaluation of the Newborn Hearing Screening Programme (NHSP) in England: Report of the Evaluation of the First Phase of Implementation of the NHSP. NLH Screening Specialist Library www.library.nhs.uk/screening/ ViewResource.aspx?resID=123519&tabID=288&cat ID=8205
- Davis A., Bamford J., Wilson I., Ramkalawan T., Forshaw M., Wright S. A critical review of the role of neonatal hearing screening in the detection of congenital hearing impairment. *Health Technology Assessment* 1997; 1(10).
- Yoshinaga-Itano C., Sedey A., Coulter D., Mehl A. Language of early- and later-identified children with hearing loss. *Pediatrics* 1998; **102**(5): 1161-71.
- Crockett R., Wright A., Uus K., Bamford J., Marteau,
  T. Maternal anxiety following newborn hearing screening: The moderating role of knowledge. *J Med Screening* 2006; **13**(1): 20-25.
- Luterman D., Kurzer-White E. Identifying hearing loss: Parents' needs. Am J Audiol 1999; 8: 13-18.