Training and competency in neonatal cranial ultrasonography – a regional online questionnaire survey

This article discusses the training and competency of registrars in performing a neonatal cranial ultrasound scan (CrUSS). It includes the results of an online regional survey of 100 trainees in the London and Eastern deaneries. This survey reveals a variation in the training received and the confidence level of registrars in performing the CrUSS.

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Key points

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1. Competency in neonatal cranial ultrasound (CrUSS) is an important aspect of training and service provision.
2. Registrars generally perform out-of-hours CrUSS on neonatal units.
3. The survey showed that not all registrars feel confident in performing and interpreting CrUSS and varied levels of training in performing scans have been received.
4. There is a lack of awareness of the BSPR technical standards for performing CrUSS.
5. There is a need for a formalised structured training programme for performing CrUSS.

The developing fetal and preterm infant brain is prone to various ischaemic, infective, inflammatory and neurotoxic insults. The various types of intracranial insults in preterm infants include germinal layer haemorrhage (GLH), intraventricular haemorrhage (IVH), haemorrhagic parenchymal infarction (HPI), cystic periventricular leucomalacia (PVL) and diffuse non-cystic white matter (WM) injury[1].

Most haemorrhages occur *in utero* or peripartum and arise most commonly within the first three days of life[2]. Hence it is very important a scan is performed soon after the delivery of a preterm infant or following traumatic delivery of a term infant, after stabilisation, in order to have a clear idea about the timing of a haemorrhage or white matter injury.

Late haemorrhages may be associated with sepsis, pneumothorax, use of vigorous ventilation and hypotension[3]. Hence scans should be performed even out-of-hours following a major event during the course of managing an infant in the intensive care unit, such as an infant with a pneumothorax and subsequent chest drain.

Neonatal cranial ultrasound scan (CrUSS) remains the mainstay of neonatal brain imaging in all neonatal units[4]. It is used routinely as an investigation in neonates both preterm and those with possible neurological abnormalities and plays a significant role in guiding management in such babies. Moreover, as an important indicator of outcome in neonatology, cranial ultrasound scans are also useful for auditing neonatal service and research studies. Results could potentially be skewed if there is no uniformity in interpreting them.

CrUSS is safe and does not require sedation. It can be performed even in a very sick baby without disturbing the ongoing intensive care. It is a very accessible tool, albeit machine-, probe- and operator-dependent and limited by the size of the fontanelle, the angulation and the signal attenuation with distance. In order to perform CrUSS the operator should be familiar with normal anatomy and variation – developmental anomalies and pathological changes as well as their interpretation in terms of prognosis in term and preterm infants. It has been recommended that there should be standardised training for the operators in order to have uniformity of practice, especially since there are medicolegal implications in terms of prognostication of long-term outcome[5].

In the UK, the majority of neonatal cranial ultrasounds are performed by the consultant neonatologists in the tertiary care centres, consultants with special interest in neonatology in the district general hospitals and middle grade paediatric staff (registrars). In some centres there are radiologists or technicians who perform the cranial ultrasound scans. However, they are unlikely to provide round the clock service when urgent scans need to be carried out. Most of the out-of-hours cranial ultrasound scans are performed by the paediatric specialist trainee registrars (SpR or ST4 level and above). The registrar trainee level is attained following 3-4 years' post qualification and after passing the membership exam of the Royal College of

Paediatrics and Child Health.

Cranial ultrasound scanning is a mandatory skill for higher specialist trainees in the neonatal grid; however, CrUSS are generally performed by all paediatric registrars in district general hospitals.

There are no formal training guidelines or mandatory training requirements for performing neonatal cranial ultrasound scans[5]. There are formal training courses available for cranial ultrasound. The Royal College of Radiologists (RCR) cite paediatric transcranial ultrasound scan as a mandatory core skill[6] for radiology trainees and the British Society of Paediatric Radiologists (BSPR) have technical standards for neonatal cranial ultrasound scans on their website[7]. These technical standards were composed jointly by the radiologists, neonatologists and sonographers.

Study design

We performed an online regional survey of the paediatric registrars of North Thames London and the Eastern Deanery, looking at the type of training received and the degree of confidence in interpreting a CrUSS. Using an online questionnaire, we enquired whether the trainees were supervised while performing these scans and were aware of the BSPR technical standards. The surveyors were from the London Deanery, posted in a District General Hospital covered by both London and Eastern Deaneries. It was therefore easy for us to access the email addresses of the trainees in these two deaneries and hence the two deaneries were chosen for the survey.

A questionnaire was designed which focused on the type of training the trainees had received in performing scans and how confident they were in interpreting the scans and discussing the prognosis/results with the parents. We enquired about the current year of their training and whether they were required to perform out-of-hours cranial ultrasound scans routinely. Further, we enquired whether they were aware of the BSPR technical standards for neonatal cranial ultrasound scans. Questions also included the method of storage of the images and the mode of documentation of the results.

Questions were set as single/multiple responses format and a free comment box was included for most of the questions. The questionnaire was sent to a hundred trainee registrars in the North Thames London and the Eastern Deaneries in January 2009 as an online link to their email addresses with a reminder a month later. All the responses were kept anonymous and online software was used for automated analysis of the responses. However, the responses were also analysed manually on an excel spreadsheet.

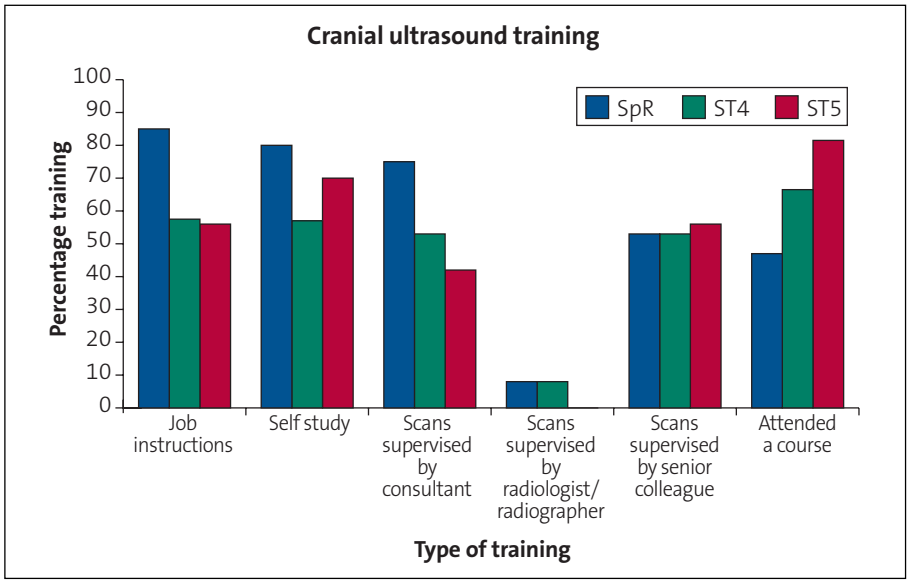

FIGURE 1 Types of training received by the specialist trainees.

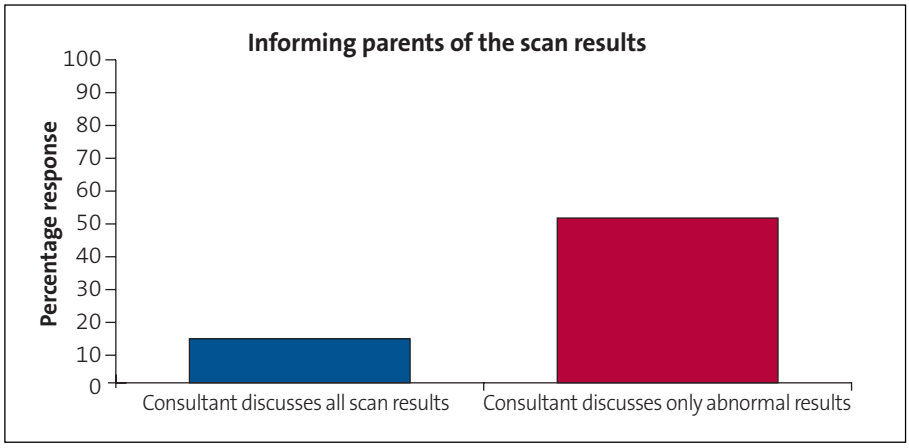

FIGURE 2 When does the consultant inform scan results to parents?

Results

Of the 100 questionnaires sent, we received a 67% percent response. Four email addresses were invalid, two registrars were no longer in paediatric specialty training and therefore were not keen to participate in the survey. Therefore our corrected response rate was 71%.

Among the 67 respondents, 25 were specialist trainee year 4 (ST4), 15 were specialist trainee year 5 (ST5) and 27 were specialist registrars (SpR). The response was not limited to the neonatal trainees. Trainees' current post ranged from general paediatrics, community paediatrics to paediatri sub-specialties.

According to the survey results, 55 (82%) of respondents were expected to perform out-of-hours cranial ultrasound scans. Forty (60%) felt fully confident in doing so, 22 (33%) reported that they could perform cranial ultrasound scans under supervision. One person reported that consultant support was available if there was need a to perform out-of-hours scanning.

Forty-four respondents (66%) had attended various ultrasound courses. Trainees also enhanced their USS skills by self study (71%), performing scans under supervision of consultants (57%), radiologist/radiographer (5%) or senior colleagues (55%). Two trainees posted at a tertiary care centre reported weekly formal training by consultants. (**FIGURE 1**).

Forty-four respondents (66%) reported that they were not aware of hospital guidelines for performing CrUSS. Twenty-seven (42%) received training by

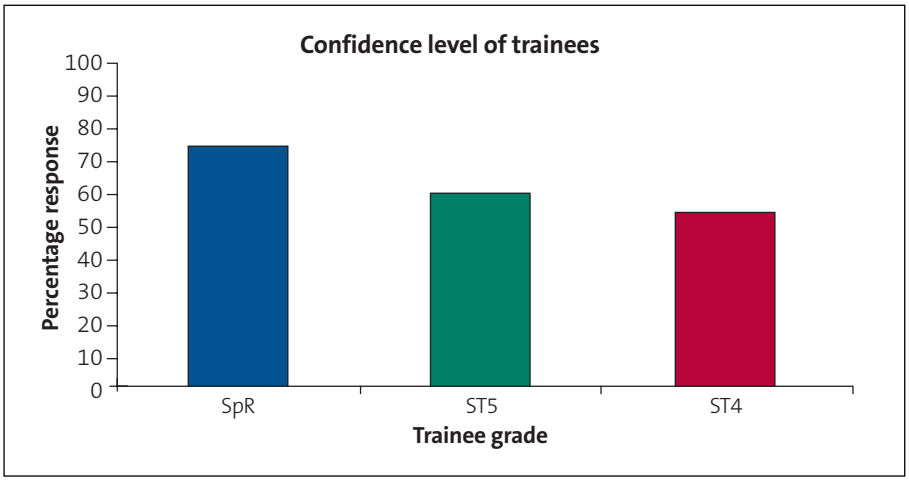

FIGURE 3 Confidence level of trainees.

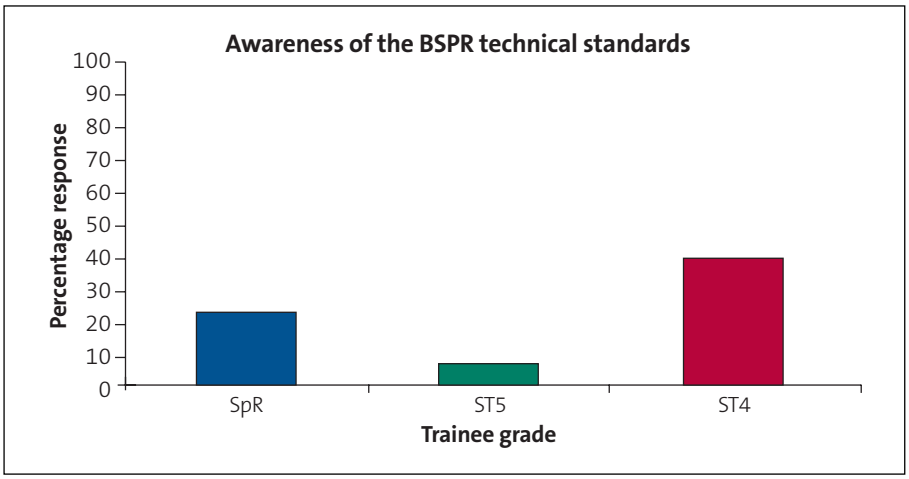

FIGURE 4 Awareness of BSPR guidelines among the trainees.

either consultant or senior colleagues in using the scanner machine on their neonatal units, but only 10 of these (24%) received this training during induction.

Regarding the confidence in reporting the scans, 25 (37%) felt they could report routine scans independently, 50 (75%) always double checked the views or pictures with the consultants before informing the results to parents. Five respondents (7%) reported reviewing of scans at weekly radiology meetings. Thirty-one (46%) reported that consultants would only discuss with parents if the scan was abnormal (**FIGURE 2**). Thirty-two (48%) registrars felt fully confident to discuss only normal results with parents (**FIGURE 3**).

The scan results were documented in various ways, with some of them using more than one format. Eighteen (27%) documented scans on the SEND (Standardised Electronic Neonatal Database), 27 (40%) wrote them in the notes. Most of the trainees (76%) wrote the results in the designated cranial ultrasound scan charts. Two (3%) of the trainees said that the images were stored on the PACS system.

The British Society of Paediatric Radiology has set technical standards[7] for performing neonatal cranial ultrasound scans which is the only national guide available. When asked about the awareness of these guidelines, 75% of the total respondents were not aware of the guidelines, with only 16 (24%) being aware of its technical standards (**FIGURE 4**).

Discussion

Clinical governance stipulates competency in CrUSS as an important requirement for a paediatrician. A survey conducted by Davis et al in 2005 involved trainees in West Midlands Deanery[8] under Callman training, which commented on the need to develop standard training of cranial ultrasound scans among paediatric trainees. However major reform in training since then has required reassessment of training needs and standards. As stated earlier, CrUSS is an important tool that influences the decisions on the continuing care and discussions with parents regarding long-term outcome. It would therefore be desirable to have structured training and formal attainment of competency for the same. The BSPR technical standard suggests a minimum requirement of attendance at a theoretical course and scanning under direct supervision of a competent sonographer, until able to scan independently. In our survey 64% attended a formal cranial ultrasound training course.

The degree of confidence among the registrars in interpreting and discussing abnormal scans with the parents was low, which could raise concerns about training. We do understand that this is a subjective question and confidence doesn't equate to competence. It was also noted that only 24% of registrars received training on how to use the scanner machine in the respective neonatal unit at induction. Since each scanner machine could be different in make and operation, we believe it is important to receive training on the scanner machine on each unit.

It was noted that there was a diversity of practice regarding documentation of the results and storage of the images. The results need to be documented consistently, as they have significant medico-legal importance.

Results of our survey indicate a need for developing a competency-based formalised structured training programme aimed at paediatric trainees who perform most of the scans on the neonatal units. We recommend that in line with the training programme by RCR for radiology trainees, a programme could be prepared by the RCPCH for the paediatric trainees. This could involve a mandatory theoretical component achieved by attending an ultrasound scan course. It would also be useful to have some reference material or texts made freely accessible in the neonatal units or the Royal College website. Training could start earlier than ST4 (Year one registrar) level so that by the time the trainees become registrars they feel confident in performing and interpreting the scans when it needs to be done independently out of hours. We recommend training to start at ST3 level when most of the trainees may be attending a post in tertiary neonates. They can be encouraged to attend a course as well during that time.

Trainees could perform ultrasound scan under supervision of a consultant

paediatrician/neonatologist or radiologist until they feel confident in doing so independently. A log book could be maintained by the trainee to be signed by a trainer on achieving the competency. This could even be made as a part of an e-portfolio.

We appreciate that this is a subjective survey and may not give a clear insight in to the problem and a nationwide survey may be needed to look at the training level of registrars across the country. However, we believe that developing formal structured training and drawing up national guidelines will ensure uniformity of practice, increase the level of confidence among the trainee registrars and improve our overall patient care.

Acknowledgement

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