Quality of neonatal cranial ultrasound interpretation among paediatric and neonatal trainees in the West Metro of Cape Town: A clinical survey

F Belay,[1,2] MD, MPhil (Neonatology); **A Horn**,[1] MB ChB, PhD; **S Pillay**,[1] MB ChB, Cert Neonatology (SA)

[1] *Division of Neonatology, Department of Paediatrics and Child Health, Faculty of Health Sciences, University of Cape Town, South Africa*
[2] *Department of Paediatrics and Child Health, Faculty of Medicine, Hawassa University, Shashamane, Ethiopia*

Corresponding author: *S Pillay (shakti.pillay@uct.ac.za)*

Background. Cranial ultrasound (cUS) is a recommended skill for paediatric and neonatal trainees in South Africa, but there are no national or regional guidelines for training.
Objectives. To survey cUS training and knowledge among paediatric and neonatal trainees working in tertiary and regional neonatal units in the West Metro area of Cape Town.
Methods. Trainees who had worked at least 1 month in neonatology on the University of Cape Town training platform were sent an online survey.
Results. Thirty-one paediatric registrars and five neonatal senior registrars were sent the survey. Responses were received from 26 of the 36 trainees (72%). None had attended a formal cUS course, 18 (69%) had attended a lecture from a neonatologist, and 8 (30%) had attended a formal consultant tutorial. Ten (38%) trainees received initial training from registrars, medical officers, or self-study. Most trainees stated the cUS report should describe anatomy (92%), haemorrhage (81%) and ventricular size (65%). Knowledge of other reporting and procedural aspects varied from 4% to 50%. Correct identification of the major features of images ranged from 12% to 92% but was below 40% in most questions. Trainees with ≥24 months experience were more likely to correctly identify a normal scan (58% v. 14%; p=0.038) and less likely to assign abnormal prognosis (0% v. 43%; p=0.017).
Conclusions. There was inadequate and variable cUS training and competency in paediatric and neonatal trainees in our institution. A national standardised programme for training and accreditation of clinician-performed neonatal cUS will address this.

Keywords. Neonate, newborn, diagnostic imaging, ultrasonography, cranial

S Afr J Child Health 2025;19(2):e2626. https://doi.org/10.7196/SAJCH.2025.v19i2.2626

Cranial ultrasound (cUS) is the most frequent imaging modality of the newborn brain.[1] It can detect abnormalities, guide management, is safe, cost-effective and portable.[2,3] Globally, the most recent standardised consensus recommendations on timing and indications for neonatal cUS were published in 2020 by the Canadian Neonatal Network (CNN) in collaboration with international experts and the Canadian Preterm Birth Network (CPTBN).[3] The guideline recommends routine cUS scans in preterm babies less than 32 weeks' gestational age (GA).[3] Additional indications for cUS are based on clinical presentation, severity of illness and pathology on initial cUS.[4,5] In addition to the anterior fontanelle, the mastoid and posterior fontanelles may be used to improve visualisation of the posterior fossa and occipital lobes, respectively.[1,6] Clinicians who perform cUS should be familiar with technical aspects, relevant anatomy, pathology, and associated prognoses; interpretation and counselling on scan findings should be done by experienced clinicians.[5] Neonatologists and radiologists should be proficient in performing neonatal cUS, which is also a recommended skill for paediatricians.[7-10] Surveys assessing knowledge of cUS and associated skills and training of paediatric and neonatal registrars in the UK between 2001 and 2010, identified marked variability and suboptimal training.[11-13] An Australian 2017 survey, predominantly undertaken by sonographers, highlighted the divided opinions regarding optimal practice; only 13% specified a fixed training period or minimum number of supervised scans.[14] Both countries subsequently established or updated national guidelines to formalise and standardise training requirements for clinicians performing and interpreting cUS.[10,15] The American Academy of Pediatrics (AAP) recommend that cUS be performed by a board-certified sonographer and the American Institute of Ultrasound in Medicine (AIUM) states that clinicians interpreting or performing cUS should meet AIUM training guidelines.[16,17] In the public sector of South Africa (SA), in-patient neonatal cUS scans are performed by sonographers, radiologists, radiology registrars and paediatric and neonatal clinicians. In the Western Cape, cUS scans are most often performed by trained neonatal medical officers, paediatric registrars rotating through neonatology, neonatal senior registrars (SRs) (paediatricians in subspecialist training posts), neonatologists and paediatricians. Training is primarily conducted at the bedside, and there are no regional or national recommendations for training and assessment of clinicians performing cUS. A survey of cUS requests by clinicians and reports by radiologists and radiology registrars in Johannesburg, SA, found that half the requests and reports were inadequate.[18,19] There are no other published studies

in Africa assessing cUS training or interpretative skills among doctors performing cUS in neonatal settings. The aim of this study was to survey trainee knowledge in cUS to inform the development of a standardised training programme in the region. The objectives were to assess level of training, skills, and knowledge in performing and interpreting cUS among paediatric registrars and neonatal SR, working in tertiary and regional neonatal units in the West Metro area of Cape Town (CT).

Methods

Study design and setting

The study was a descriptive online survey of paediatric registrars and neonatal SRs in the Department of Paediatrics and Child Health at the University of Cape Town (UCT). Paediatric registrars rotate 3-monthly at one or more of the following hospitals: Groote Schuur Hospital (GSH), Mowbray Maternity Hospital (MMH) and New Somerset Hospital (NSH). All three hospitals provide neonatal ventilation. Owing to the limited number of registrars, convenience sampling was used. Registrars on the UCT training platform, with at least 1 month of neonatal service at any of the hospitals above, who consented, were eligible for inclusion. There were no exclusion criteria. At the time of the survey 31 paediatric registrars and 5 neonatal SRs met inclusion criteria and were invited to participate. The study was approved by the Health Sciences Faculty Human Research Ethics Committee (ref. no. HREC 102/2022) and the UCT Department of Student Affairs. The study was conducted in accordance with the principles of the Declaration of Helsinki (2013).[20]

Cranial ultrasound scanning protocol

The screening protocol for cUS scans at all three hospitals is based on the Canadian guideline.[3] Routine scans are performed in well preterm babies <32 weeks' GA or with birthweights <1 500 g between days 3 and 5 and are repeated on day 28 or discharge (whichever comes first); further scans depend on initial findings. Other indications in term and preterm babies include antenatally detected brain abnormalities, syndromes with

central nervous system abnormalities, abnormal neurology, mechanical ventilation, sepsis, congenital infections, necrotising enterocolitis, recurrent apnoea or bradycardia, rapid decreases in haemoglobin or platelet counts, abnormal head growth, metabolic disorders, haemodynamic instability, and acute clinical deterioration.[3,21] The protocol specifies that all abnormal and uncertain findings must be reviewed by a senior clinician, with clear guidelines on reporting parameters.

Data collection and analysis

Email addresses of trainees were obtained from the UCT registrar training programme administrator. The online survey was conducted using Google Forms after piloting by two neonatologists who have instructed on national cUS training courses. Eligible registrars received an email with study information, the consent statement, and a link to an online survey. Participants were not reimbursed. The survey only commenced after participants confirmed they had read and agreed to the consent statement and had completed at least 1 month of neonatology. Voluntary consent was implied by submitting the survey. Participants had to complete the survey in one sitting and could opt out at any point. Questions were marked as 'required' to ensure completeness and minimise non-response bias. High-quality cUS images were sourced from open access publications and de-identified images from babies at GSH, with retrospective permission for use in teaching and publications.[1,3]

The survey assessed the following:

- Job position and year of training
- Experience with neonatal cUS (skill acquisition and degree of supervision)
- Knowledge of cUS reporting
- Knowledge of procedural and technical aspects of cUS
- Interpretation of common neonatal cUS pathologies and outcomes
- Confidence in scan interpretation and parental discussion of findings.

Participants received email reminders 2 and 4 weeks after the initial email, with additional reminders at departmental meetings and on departmental WhatsApp groups. Survey access was closed 2 months after the initial email; following this, participants were emailed the answers to the seven cUS scan images. The anonymous raw data were stored in a password-protected Google account, accessible only to study researchers. The survey is available as supplementary file 1 (www.xxxx). Statistical analyses using standard descriptive measures were performed using Stata version 12 (StataCorp, USA). Management, procedural, and diagnostic knowledge were compared between groups with or without at least 24 months' experience using χ^2 or Fisher's exact test for categorical variables and Wilcoxon rank sum for continuous variables. Statistical significance was assigned as $p<0.05$.

Results

Thirty-one paediatric registrars and 5 neonatal SRs were sent the survey. Twenty-six (72%) surveys were completed and returned (22 paediatric registrars and 4 neonatal SRs). Twelve (46%) surveys were from doctors with ≥24 months' experience with cUS.

Training profile of participants

No participant had attended a certified cUS course; 18 (69%) had one formal lecture from a neonatologist, and 8 (30%) had attended a formal bedside tutorial by a consultant (paediatrician/neonatologist). Ten (38%) participants received cUS training from a neonatal SR, 7 (27%) from a medical officer, 6 from a consultant (23%), 1 from a paediatric registrar (4%), and 2 from self-study (8%). The median (range) number of cUS scans performed per week by all participants was 3 (1 - 15) – there was no correlation with duration of cUS experience ($p=0.700$). Only 5 (19%) participants discussed all scans with a consultant and only 10 (38%) participants discussed all scans with parents. Three (12%) participants discussed cUS results with parents before discussion with a consultant – all 3 were in their first 2 years of paediatric registrar training.

Knowledge of ultrasound reporting

Data extracted from the free-text responses to the question 'What information should be included in the cUS report?' are summarised in Table 1. Most participants did not include the day of life of the baby, scan date, name of the doctor or name of the baby. Anatomical description, bleeding and ventricular size were described by the majority. All other aspects of the report were each described by ≤50% of participants. Ventricular measurements were only mentioned by 35% and abnormalities/lesions, increased echogenicity or parenchymal changes were only mentioned by 19%.

Ultrasound procedural knowledge

The participants' procedural knowledge of cranial ultrasound is shown in Table 2. There were no significant differences in the responses relative to duration of experience. All participants were

comfortable scanning through the anterior fontanelle; however, less than a third knew the correct number of views in the sagittal and coronal planes. Most were not comfortable scanning through other cUS windows and less than half were able to set transducer frequency and focus point.

Table 1. Knowledge of cranial ultrasound reporting

What information should be included in the cranial ultrasound report?	*n* (%)*
Day of life	5 (19)
Date of scan	2 (8)
Name of doctor	1 (4)
Name of baby	2 (8)
Limitations to scan	2 (8)
Presence or absence of bleeds	21 (81)
Description of anatomy/midline structures	24 (92)
Presence or absence of flares	10 (38)
Presence or absence of lenticostriatal vasculopathy	1 (4)
Presence or absence of periventricular leukomalacia	6 (23)
Poor grey/white matter differentiation	2 (8)
Presence or absence of cysts	9 (35)
Description of ventricular sizes	17 (65)
Ventricular measurements	9 (35)
Presence or absence of calcifications	7 (27)
Description of brain maturity and/or cortical folding	13 (50)
Description of abnormalities or obvious intracranial lesions	5 (19)
Description of anatomy/midline structures and abnormalities/lesions	4 (15)
Description of increased echogenicity	5 (19)
Description of parenchymal changes	5 (19)
Description of cerebral oedema	1 (4)
Discussed with consultant and plan for next scan	2 (8)
Unsure	1 (4)

*Each item represents a feature which should be described in the report; *n* (%) represents the proportion of respondents who included the feature in their free text description of a cUS report.

Ultrasound image interpretation

Participants' knowledge of cUS image interpretation is shown in Table 3. Participants were asked to list abnormalities shown by the image in each question or indicate that there were no abnormalities and describe the neurodevelopmental prognosis. Significant differences in the responses relative to duration of experience only occurred in questions 4 and 6.

Question 1: Coronal and left parasagittal images from a 21-day-old baby born at 26 weeks' GA. The images showed bilateral periventricular leukomalacia (PVL) involving deep/subcortical white matter (grade 4 PVL), bilateral ventriculomegaly and resolving intraventricular haemorrhages (IVH). While most participants identified cystic lesions and/or PVL, only 42% specified that it was extensive, severe, or grade 4. Dilated ventricles were noted by 58%. Only 8% correctly described all three abnormalities. Most participants correctly described neurodevelopment as 'likely to be very abnormal'.

Question 2: Coronal and right parasagittal images from a 2-day-old baby born at 24 weeks' GA showed a right periventricular (PV) haemorrhagic infarction (grade 4 IVH) and a left grade 3 IVH. Most participants identified the grade 4 IVH on the right; however, less than a third correctly identified both bleeds and only 15% stated the side of the bleeds. Most participants correctly described neurodevelopment as 'likely to be very abnormal'.

Question 3: A coronal image from a 25-day-old baby born at 28 weeks' GA showed bilateral posthaemorrhagic ventricular dilatation (PVHD). Participants were asked what additional clinical and cUS information would aid in assessing cause and severity. While almost all noted the ventricular dilatation, only 15% suggested measuring ventricular indices. Only 54% correctly assessed the neurodevelopmental prognosis as 'likely to be very abnormal'.

Question 4: Coronal and left parasagittal views from a 4-day-old term baby with hypoxic ischaemic encephalopathy (HIE). The images showed increased white matter echogenicity bilaterally, increased grey/white matter differentiation, increased basal ganglia and thalamic echogenicity, and decreased internal capsule echogenicity. Less than one-third identified increased echogenicity in any area and none noted decreased echogenicity of the internal capsule. The terms, 'oedema', 'slit-like', or 'small ventricles', which are misleading and inappropriate in neonatal cUS, were used by over

Table 2. Procedural knowledge of cranial ultrasound (cUS)

Question	*n* (%)/median (range)*			
	All participants, *N*=26	<24 months' cUS experience, *n*=14	≥24 months' cUS experience, *n*=12	*p*-value
How many anterior fontanelle views should be examined in the sagittal plane?	5 (3 - 7)	5 (3 - 7)	5 (4 - 7)	0.72
How many anterior fontanelle views should be examined in the coronal plane?	5 (3 - 9)	5 (4 - 6)	5 (3 - 9)	0.63
Are 5 views in sagittal and 6 views in coronal planes the standard number?	7 (27)	4 (29)	3 (25)	1.00
Comfortable scanning through the posterior fontanelle?	4 (15)	1 (7)	3 (25)	0.31
Comfortable scanning through the temporal window?	1 (4)	1 (7)	0	1.00
Comfortable scanning through the mastoid fontanelle?	2 (8)	1 (7)	1 (8)	1.00
Able to set scan depth?	24 (92)	12 (86)	12 (100)	0.48
Able to set scan area?	18 (69)	10 (71)	8 (67)	1.00
Able to set scan gain?	23 (88)	11 (79)	12 (100)	0.23
Able to set transducer frequency?	11 (42)	6 (43)	5 (42)	1.00
Able to set focus point?	9 (35)	4 (29)	5 (42)	0.68

*Data are *n* (%) for the proportion of participants who answered yes to the questions, and median (range) for the summary of numeric answers.

Table 3. Ultrasound image interpretation

Image findings and outcomes	All participants, *N*=26	<24 months' cUS experience, *n*=14	≥24 months' cUS experience, *n*=12	*p*-value
Question 1				
Grade 4 periventricular leukomalacia (PVL), dilated ventricles and intraventricular haemorrhages (IVH) (all abnormalities detected)	2 (8)	1 (7)	1 (8)	1.00
PVL/cystic lesions, dilated ventricles and IVH (major feature) (no mention of the grade or severity of the PVL)	3 (12)	2 (14)	1 (8)	1.00
PVL/cystic lesions and dilated ventricles or IVH	10 (38)	5 (36)	5 (42)	1.00
Extensive or severe grade 4 PVL	11 (42)	4 (29)	7 (58)	0.23
PVL/cystic lesions (no mention of grade or severity of the PVL)	8 (31)	5 (36)	3 (25)	0.68
Dilated ventricles	15 (58)	9 (64)	6 (50)	0.69
IVH	9 (35)	5 (36)	4 (33)	1.00
Outcome: Neurodevelopment likely to be very abnormal	20 (77)	10 (71)	10 (83)	0.65
Question 2				
Left grade 3 IVH, right IVH with PV haemorrhagic infarction (grade 4 IVH) (all abnormalities)	4 (15)	1 (7)	3 (25)	0.31
Correct diagnosis but did not mention left or right (major feature)	4 (15)	1 (7)	3 (25)	0.31
Grade 3 IVH	12 (46)	6 (43)	6 (50)	1.00
Grade 4 IVH	18 (69)	8 (57)	10 (83)	0.22
Outcome: Neurodevelopment likely to be abnormal	19 (73)	10 (71)	9 (75)	1.00
Question 3				
Ventriculomegaly/hydrocephalus (major feature)	24 (92)	12 (85)	12 (100)	0.48
Ventricular measurement recommended	4 (15)	1 (7)	3 (25)	0.31
Head circumference measurement recommended	6 (23)	4 (29)	2 (17)	0.65
All three aspects correct	1 (4)	0	1 (8)	0.46
Outcome: Neurodevelopment likely to be abnormal	14 (54)	7 (50)	7 (58)	0.71
Question 4				
Increased white matter echogenicity	6 (23)	3 (21)	3 (25)	1.00
Abnormal grey/white matter differentiation (major feature)	7 (27)	5 (36)	2 (17)	0.39
Increased basal ganglia echogenicity	2 (8)	1 (7)	1 (8)	1.00
Increased thalamic echogenicity	4 (15)	3 (21)	1 (8)	0.60
Decreased echogenicity internal capsule	0	0	0	
All 5 abnormalities correct	0	0	0	
'Oedema'/'slit-like' or 'small ventricles' described	15 (58)	6 (43)	9 (75)	0.13
Outcome: Neurodevelopment likely to be abnormal	6 (23)	6 (43)	0	0.02
Question 5				
Left caudothalamic cyst (major feature)	3 (12)	0	3 (25)	0.09
Caudothalamic cyst but no side stated	0	0	0	
Cyst noted but inadequate/incorrect description	12 (46)	6 (43)	6 (50)	1.00
Grade 1 IVH	0	0	0	
All three abnormalities correct	0	0	0	
Normal scan (incorrect)	4 (15)	3 (21)	1 (8)	0.60
Outcome: Neurodevelopment may be abnormal	15 (58)	8 (57)	7 (58)	1.00
Question 6				
Normal scan (major feature)	9 (35)	2 (14)	7 (58)	0.04
'Oedema'/'slit-like' or 'small ventricles' described	11 (42)	8 (57)	3 (25)	0.13
Outcome: Normal	4 (15)	1 (7)	3 (25)	0.31
Question 7				
Echodensity basal ganglion/thalamus	17 (65)	9 (64)	8 (67)	1.00
Echodensity basal ganglion/thalamus due to infarction/stroke/bleed (with or without side specified) (major feature)	16 (62)	8 (57)	8 (67)	0.70
Echodensity right basal ganglion/thalamus due to infarction/stroke	5 (19)	2 (14)	3 (25)	0.64
Cerebral bleed/infarct – side/region absent/incorrect	13 (50)	7 (50)	6 (50)	1.00
Outcome: Neurodevelopment may be abnormal	14 (54)	8 (57)	6 (50)	1.00

half of the participants. None of the participants with ≥24 months' experience correctly indicated outcome was 'likely to be abnormal' compared with 43% of those with <24 months' experience.

Question 5: Coronal and left and right parasagittal images of a 4-day-old term baby with neonatal encephalopathy. The images showed a left caudothalamic cyst, PV calcifications and a right grade 1 IVH. The caudothalamic cyst was noted by more than half of participants, but only 12% specified the left side. Calcifications were noted by one participant, but the IVH was not noted; 15% assessed the scan as normal. Neurodevelopmental outcome was correctly described by 58%.

Question 6: A normal coronal scan from a 1-day-old term baby with HIE. More than half of participants with ≥24 months' experience correctly interpreted the scan as normal compared with 14% of those with less experience.

Question 7: Coronal image of an 8-day-old term baby with seizures. The image showed a focal echodensity in the medial right basal ganglia, in keeping with an infarction in the middle cerebral artery territory. An echodensity in the basal ganglia/thalamic area was noted by 65% of participants; most indicated the likely cause to be infarction/stroke/bleed. However, only 19% specified the correct side. Neurodevelopmental outcome was correctly described as 'may be abnormal' by 54%.

Discussion

This survey assessing cUS training among paediatric registrars and neonatal SRs in Cape Town, had a 72% response rate and is the first in Africa. Over half of the participants had <2 years' experience. There was significant variability in training formats and the experience of trainers. None of the participants demonstrated adequate knowledge of the essential components of an ultrasound report. Although all were comfortable scanning

through the anterior fontanelle, most were unaware of the standard number of images per plane or how to optimise images. The ability to identify the major features of ultrasound images in seven questions ranged from 12% to 92% but was below 40% in most questions.

The variable training often included formal lectures, but formal bedside tutorials were infrequent, and bedside training was provided by both senior and junior staff. A similar variation and inadequacy of bedside training was reported in some UK surveys; performing scans without supervision was reported by 25%.[12,13] However, approximately half of the UK registrars attended cUS training courses compared with none of the participants in our survey.[11,13]

The inadequate knowledge of ultrasound reporting standards, image optimisation techniques and image interpretation are not unique to our survey. In the UK, Reynolds et al.[11] observed that almost half of their respondents were not aware of the benefit of a lower frequency probe for visualising deeper structures in term infants and correct image interpretation ranged from 45% to 71%. In other UK surveys, confidence in independently performing or reporting on cUS ranged from 37% to 51%.[12,13] Only 19% of participants in our survey discussed all scans with consultants, compared with 75% in the 2010 UK survey.[13] In addition, neurodevelopment prognosis was only appropriately assigned by less than half of the participants for most questions in our survey – fortunately, most did not discuss findings with parents before discussing with the supervising consultant.

The authors of the UK surveys call for more structured training, measures of competency, and the implementation of existing standards; 75% of the registrars in the 2010 study[13] were not aware of the standard published by the British Society of Paediatric Radiology in 2003.[12] The standard, as quoted by Davis et al.,[12] suggests a minimum requirement of a theoretical course and scanning under direct supervision until competent to scan independently. The most recent UK standard for performing neonatal cUS and associated training was published in 2022 as part of a larger document, 'Society of Radiographers and British Medical Ultrasound Society Guidelines for Professional Ultrasound Practice'.[10] The document stipulates detailed requirements on all aspects of performing neonatal ultrasound scans. The guideline also endorses two further documents: the eurUS.brain summary[1] of technique and reporting ultrasounds and the recommendations from the Royal College of Radiologists for training and competency requirements for clinicians who perform cUS in infants.[23] The British Association of Perinatal Medicine, the Royal College of Paediatrics and Child Health and the Neonatal Society are also listed as supporters of the European Standards of Care for Newborn Health (ESCNH) project set up by the European Foundation for the Care of Newborn Infants.[24] The ESCNH includes standards for neonatal cUS and are endorsed by numerous other countries in Europe and multiple global neonatal associations.

Several other countries and regions have established training requirements for performing and interpreting cUS. The Australasian Society for Ultrasound in Medicine (ASUM) requires a certificate in Neonatal Clinician Performed Ultrasound (CCPU Neonatal) based on standardised training, including courses, accredited hospital on-site training and standardised competency assessments.[15] In 2020, the AIUM published 'AIUM Practice Parameter for the Performance of Neuro-sonography in Neonates and Infants' which contains guidance regarding performing neonatal cUS and training requirements.[17]

The Canadian consensus guidelines on screening and classifying preterm brain injury emphasise the need for cUS interpretation by an experienced specialist – although training requirements are not described, online training is available via the Calgary Neonatal Neuro-Critical Care Program.[3,25]

In SA, neonatal cUS is a required competency for the paediatric specialty and the neonatal subspecialty.[7] There are no previous studies of cUS training in these disciplines and requirements have not been formalised; however, the inadequate knowledge of reporting cUS and the lack of national guidelines was highlighted in a survey of reports by radiologists and radiology registrars in Johannesburg, where the authors proposed the use of a cUS reporting template.[18,19] Training could be improved with a standardised interactive video training package and specific cUS outputs in the clinical skills logbook as a prerequisite for specialist paediatric and neonatology examinations in SA, e.g. *(i)* reporting; *(ii)* procedural and technical aspects; *(iii)* common neonatal pathologies and outcomes; and *(iv)* required number of supervised scans for each pathology. The strengths of our survey included consideration of the duration of training, images from peer-reviewed publications, survey of multiple aspects of training and knowledge, and a 72% response rate. Limitations included the challenges of interpreting static v. dynamic images, the potential for consultation when interpreting images, limited survey detail and the limited sample from a single university. A nationwide survey would better represent trainees across the country.

Conclusion

The inadequate and variable cUS training and competency demonstrated in this survey parallels the radiologist experience in Johannesburg and the deficiencies experienced in international studies published over a decade ago.[11-13,19] Considering the influence of cUS imaging on neonatal management, and determining

prognosis, and its potential medicolegal consequences, this survey provides motivation for national standardisation of diagnostic and training criteria, and formal accreditation processes for clinicians performing and reporting on neonatal cUS.

Declaration. None.

Acknowledgements. We acknowledge and thank the registrars for participating in the survey.

Author contributions. FB wrote the protocol under supervision of SP and AH, monitored survey responses, interpreted results, and drafted the initial manuscript. SP and AH conceived the project, supervised the protocol writing, guided the process of data collection, data analysis and supervised the writing of the manuscript. SP designed the Google form. All authors reviewed and approved the final manuscript.

Funding. FB was funded by the African Paediatric Fellowship Training Programme, University of Cape Town.

Conflicts of interest. None.

1. Dudink J, Steggerda SJ, Horsch S, eurUS.brain group. State-of-the-art neonatal cerebral ultrasound: Technique and reporting. Pediatr Res 2020;87(suppl 1):3-12. https://doi.org/10.1038/s41390-020-0776-y
2. Caro-Domínguez P, Lecacheux C, Hernandez-Herrera C, Llorens-Salvador R. Cranial ultrasound for beginners. Transl Pediatr 2021;10(4):1117–1137. https://doi.org/10.21037/tp-20-399
3. Mohammad K, Scott JN, Leijser LM, et al. Consensus approach for standardizing the screening and classification of preterm brain injury diagnosed with cranial ultrasound: A Canadian perspective. Front Pediatr 2021;9:618236. https://doi.org/10.3389/fped.2021.618236
4. Beltempo M, Wintermark P, Lemyre B, et al. Predictors of severe neurologic injury on ultrasound scan of the head and risk factor-based screening for infants born preterm. J Pediatr 2019;214:27-33. https://doi.org/10.1016/j.jpeds.2019.06.065
5. Van Wezel-Meijler G, Steggerda SJ, Leijser LM. Cranial ultrasonography in neonates: Role and limitations. Semin Perinatol 2010;34(1):28-38. https://doi.org/10.1053/j.semperi.2009.10.002
6. Steggerda SJ, Leijser LM, Walther FJ, van Wezel-Meijler G. Neonatal cranial ultrasonography: How to optimise its performance. Early Hum Dev 2009;85(2):93-99. https://doi.org/10.1016/j.earlhumdev.2008.11.008
7. Colleges of Medicine of South Africa (CMSA). FC Paed (SA) Portfolio and Cert (Neon) Portfolio. https://www.cmsa.co.za/view_exam.aspx?QualificationID=20 (accessed 5 January 2023).
8. The Royal Australasian College of Physicians, Neonatal/Perinatal Medicine Advanced Training Curriculum Paediatrics & Child Health Division 2010 (revised 2013). https://www.racp.edu.au/docs/default- source/trainees/advanced-training/neonatal-and-perinatal-medicine/neonatal-perinatal-medicine-advanced-training-curriculum.pdf?sfvrsn=e1202c1a_10 (accessed 1 December 2023).
9. Royal College of Paediatrics and Child Health. Neonatal Medicine Syllabus, Level 3, Paediatrics Subspecialty Syllabus 2018. https://www.rcpch.ac.uk/education-careers/training/progress/curriculum (accessed 1 December 2023).
10. The Society of Radiographers. Guidelines for Professional Ultrasound Practice: 7th ed. 2022. https://www.sor.org/news/ultrasound/guidelines-for-professional-ultrasound-practice-7t (accessed 1 December 2023).
11. Reynolds PR, Dale RC, Cowan FM. Neonatal cranial ultrasound interpretation: A clinical audit. Arch Dis Child Fetal Neonatal Ed 2001;84(2):92-95. https://doi.org/10.1136/fn.84.2.f92
12. Davis PJC, Cox RM, Brooks J. Training in neonatal cranial ultrasound: A questionnaire survey. Br J Radiol 2005;78(925):55-56. https://doi.org/10.1259/bjr/63858589
13. Banerjee J, Bhojani S, Khan A. Training and competency in neonatal cranial ultrasonography – a regional online questionnaire survey. Infant 2010;6(6):202-205.
14. Lalzad A, Wong F, Singh N, et al. Knowledge of safety, training, and practice of neonatal cranial ultrasound: A survey of operators. J Ultrasound Med 2018;37(6):1411-1421. https://doi.org/10.1002/jum.14481
15. Australasian Society for Ultrasound in Medicine (ASUM). Certificate in Clinician Performed Ultrasound (CCPU) Neonatal 2022. https://www.asum.com.au/education/ccpu-course/ccpu-neonatal/ (accessed 1 December 2023).
16. Hand IL, Shellhaas RA, Milla SS, et al. Routine neuroimaging of the preterm brain. Pediatrics 2020;146(5):e2020029082. https://doi.org/10.1542/peds.2020-029082
17. AIUM practice parameter for the performance of neurosonography in neonates and infants. J Ultrasound Med 2020;39(5):57-61. https://doi.org/10.1002/jum.15264
18. Mutshutshu NP. Determination of the adequacy of cranial ultrasound requests and reports at Charlotte Maxeke Johannesburg Academic Hospital and Rahima Moosa Mother and Child Hospital (dissertation). MMed Diagnostic Radiology, University of the Witwatersrand, 2016.
19. Mutshutshu NP, Hlabangana LT. Are cranial ultrasound requests and reports adequate at two academic hospitals in Johannesburg? S Afr J Rad 2017;21(1):1182. https://doi.org/10.4102/sajr.v21i1.1182
20. World Medical Association. Declaration of Helsinki: Ethical principles for medical research involving human subjects. JAMA 2013;310(20):2191-2194. https://doi.org/10.1001/jama.2013.281053
21. Pillay S, ed. Neonatal Guidelines and Drug Doses 2022. 6th ed. Cape Town: Cape Town Neonatal Consultancy, 2021.
22. Ben Fadel N, Pulgar L, Khurshid F. Point of care ultrasound (POCUS) in Canadian neonatal intensive care units (NICUs): Where are we? J Ultrasound 2019;22(2):201-206. https://doi.org/10.1007/s40477-019-00383-4
23. Royal College of Radiologists. Ultrasound training recommendations for medical and surgical specialties 2022. https://www.bmus.org/static/uploads/resources/bfcr173_ultrasound_training_med_surg.pdf (accessed 1 December 2023).
24. European Standards of Care for Newborn Health. Neurological monitoring in the high-risk infant: Ultrasound and MRI scanning 2021. https://newborn-health-standards.org/downloads/ (accessed 1 December 2023).
25. Calgary Neonatal Neuro-Critical Care. https://nncceducation.thinkific.com/ (accessed 1 December 2023).

Received 11 September 2024. Accepted 21 January 2025.