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Abdulkadir Isa
Nazir Hamisu Usman
Iduze Abdullahi
Abdullahi Fatima L
Hassan Laila
Musa Abdullahi
Farouk Zubaida Ladan
Oguche Stephen
Sunil John
Bjorklund Ashley
Slusher Tina M

Point-of-care ultrasound as an integral component of clinical evaluation: A report on training at the Ahamdu Bello University Teaching Hospital Zaria, Nigeria

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Abdulkadir Isa, (✉)
Nazir Hamisu Usman,
Iduze Abdullahi,
Abdullahi Fatima L, Hassan Laila,
Musa Abdullahi
Department of Paediatrics,
Ahmadu Bello University/ Teaching Hospital Zaria, Kaduna State Nigeria.
Email: isaburamla@yahoo.com

Farouk Zubaida Ladan
Department of Paediatrics,
Aminu Kano University Teaching Hospital Kano,
Kano State, Nigeria

Oguche Stephen
Department of Paediatrics,
Jos University Teaching Hospital
Jos, Plateau State, Nigeria

Sunil John
United Mission Hospital Tansen,
Nepal

Bjorklund Ashley, Slusher Tina M
University of Minnesota,
Minneapolis USA

Abstract: *Background:* Point-of-care ultrasound (POCUS) is increasingly recognized as an essential tool in clinical practice, providing real-time, bedside imaging that can enhance diagnostic accuracy and improve patient outcomes. Over the past two decades, POCUS has achieved widespread acceptance in clinical medicine across numerous regions and subspecialties. Its use in neonatology (Neo POCUS) has recently gained momentum, with neonatologists in Europe, America, and Asia participating in training sessions to enhance their knowledge and skills and to advance neonatal care. However, formal POCUS training for neonatologists and/or paediatricians in Nigeria remains limited.
Objectives: This report aims to describe an eight-week intensive POCUS training held at Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, Nigeria, targeted at paediatricians from four tertiary institutions. The training focused on skills development in lung, abdominal, cardiac, vascular, and cranial scans.
Methods: Nineteen POCUS-naïve paediatric healthcare professionals from four tertiary hospitals participated. The training comprised seven weeks of virtual sessions followed by a one-week in-person workshop. The virtual component included weekly didactic lectures, demonstrations, quizzes, and hands-on assignments, with participants uploading scanned images for instructor feedback. The in-person component focused on supervised hands-on practice covering key POCUS applications. We incorporated all the learners into the training hands on part by having the observers be either the drivers of the image changing or the person pointing out the structures while the third person was the probe movers thus engaging multiple learners during the sessions. Competency was assessed using a standardized checklist evaluating (1) diagnostic image quality acquisition (2) machine handling and (3) identification of ≥ 80% key anatomical landmarks and pathologies.
Participants completed pre-and post-training assessing self-reported confidence using a 5-point Likert Scale. Certification was awarded to those who met the defined criteria.
Results: All participants reported low or no confidence before the training. Post-training, 85% (n=16) reported moderate to high confidence in performing lung and abdominal scans; 40% (n= 7) felt similarly for cardiac and cranial scans. Eighteen of 19 participants met the criterion for certification, defined as scoring ≥ 80% on the practical skills assessment checklist. A virtual network was created for image sharing and mentorship, promoting skill retention and continuous learning.
Conclusion: The training successfully improved participants' subjective confidence and showed measurable skill acquisition through objective competency assessment. To ensure sustainabil

sustainability, such programmes should be scaled nationally, integrated into paediatric residency curricula in Nigeria and supported through mentorship, accessibility to user-friendly devices and collaborative networking for ongoing training/refresher training.

Keywords: Training, applications, neonates, point-of-care-ultrasound, POCUS, neonatology.

Résumé: L'échographie au lit du malade (POCUS) est un outil essentiel en pratique clinique, offrant une imagerie en temps réel au chevet du patient, améliorant la précision diagnostique et les résultats. Son utilisation en néonatologie (NeoPOCUS) se développe, mais la formation formelle des pédiatres et néonatologistes au Nigeria reste limitée.
Objectifs: Décrire une formation intensive de huit semaines en POCUS à l'Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, Nigeria, pour des pédiatres de quatre hôpitaux tertiaires, visant le développement de compétences en échographie pulmonaire, abdominale, cardiaque, vasculaire et crânienne.
Méthodes: Dix-neuf professionnels novices en POCUS ont suivi sept semaines de sessions virtuelles (cours, démonstrations, quiz et exercices pratiques) et un atelier pratique d'une semaine. La pratique en petits groupes engageait simultanément plusieurs apprenants. La compétence a été évaluée via une grille standardisée portant sur la qualité des images, la manipulation de l'appareil et l'identification d'au moins 80 % des repères anatomiques et pathologies. Les participants ont évalué leur confiance pré et post-formation sur une échelle de Likert. La certification était délivrée aux participants satisfaisant aux critères définis.
Résultats: Avant la formation, tous rapportaient une faible confiance. Après la formation, 85 % se sentaient modérément à très confiants pour les échographies pulmonaires et abdominales, et 40 % pour les échographies cardiaques et crâniennes. Dix-huit participants sur 19 ont satisfait aux critères de certification. Un réseau virtuel a été créé pour le partage d'images et le mentorat, favorisant la rétention des compétences et l'apprentissage continu.
Conclusion: La formation a amélioré la confiance et permis l'acquisition de compétences mesurables. Pour assurer la durabilité, ces programmes devraient être étendus à l'échelle nationale, intégrés aux cursus de résidence pédiatrique et soutenus par le mentorat et l'accès à des dispositifs conviviaux.

Introduction

Point-of-care ultrasound (POCUS) is a transformative tool in clinical evaluation, enabling physicians to perform real-time imaging that guides rapid decision-making at the bedside. The role of POCUS is rapidly gaining ground due to the enhanced portability, image quality, and ergonomic facility of modern ultrasound machines.[1,2]Paediatricians in the Neonatal Intensive Care Unit (NICU) or Emergency Rooms (ER) use the wide range of POCUS applications to make rapid diagnoses, guide resuscitation, enhance procedural success and minimize complications.[3] NeoPOCUS remains underdeveloped and underutilized in Africa, particularly in Nigeria. Globally, challenges to implementing NeoPOCUS include structural issues, lack of functional neonatal units, insufficient skilled manpower (e.g. neonatologists), and inadequate access to ultrasound machines mainly due to high cost of ultrasound equipment coupled with challenges maintaining the equipment due to environmental issues. Additional barriers include limited training, certification, protocols, and legal support for sustaining POCUS practices.[4] A critical step toward improvement is establishing NeoPOCUS integration with a focus on training skilled providers, which can enhance diagnosis and treatment for better neonatal outcomes. Recognizing this gap, the Ahmadu Bello University Teaching Hospital (ABUTH) Zaria, in collaboration with Stop Kernicterus and Infection in Northern Nigeria (SKIINN) Consortium, recently organized an eight-week POCUS training workshop, aimed at equipping neonatologists and paediatricians with foundational skills in ultrasound imaging using the train the trainer model. This report describes the training approach, the immediate outcomes among participants, and the emerging network for image sharing and continuous mentorship, which could serve as a model for broader integration of POCUS into paediatrics practice in Nigeria.

Methods

Participants

A total of 19 participants from four tertiary institutions participated in this training, all of whom were POCUS-naïve (Table 1).

Table 1: POCUS trainees

S/N	Cadre of trainee	Institution ABUTH	AKTH	JUTH	BUTH	Total
	Neonatologists	4	3	1	1	9
	Other Paediatricians	1	0	2	0	3
	Residents in- training	4	2	1	0	7
	TOTAL	9	5	4	1	19

ABUTH: Ahmadu Bello University Teaching Hospital Shika – Zaria. AKTH: Aminu Kano University Teaching Hospital Kano, JUTH: Jos University Teaching Hospital Jos. BUTH: Bingham University Teaching Hospital Jos

Training Structure

The eight-week intensive training package/ programme included a seven- week virtual and a one week in- person on site intensive components Preparation for the training involved a series of virtual planning meetings to

develop a training curriculum and schedules, and review training requirement and materials checklists. The programme featured virtual didactic lectures (60- 120 minutes weekly), demonstrations and quizzes. Post-lecture, trainees were given homework assignments involving real- patient scans in their respective centres based on the lecture and training delivered for the week. Each week, participants uploaded images for discussion and feedback from the instructors, promoting iterative learning process. Videos, links, reading materials and the recorded lectures were shared to reinforce learning. The trainers and the coordinator met virtually at the end of each week to assess the successes and challenges of the week's lectures and training and to prepare for the upcoming week.

The in- person training took place at the ABUTH – Zaria. It was a 5- day intensive training which was preceded by a one- day physical planning meeting during which final review for preparedness for the training was conducted and some vascular models for the training were prepared. This covered five main POCUS applications:

1. Lung Scans – focusing on common paediatric conditions such as pneumonia, pneumothorax, pleural effusions, and lung consolidation.
2. Abdominal Scans (FAST Exam) – focusing on evaluation of solid organs and free fluid.
3. Cardiac Scans – focusing on demonstrating normal cardiac structures in different views, identifying basic structural abnormalities and assessing cardiac function.
4. Cranial Scans – focused on neonates and young children to detect signs of intracranial hemorrhage, ventriculomegaly, and other common pathologies.
5. Vascular scan – focused on assessment of inferior vena cava, aorta and needle tracking in the peripheral veins

The training methodology included theoretical lectures, live demonstrations by instructors with child models, and supervised hands-on practice. The instructors, experienced POCUS users from the United States and Nigeria, provided real-time guidance and feedback as the participants practiced image acquisition and interpretation. The practical sessions were structured so that each participant had significant time with the ultrasound machine, ensuring familiarity and competence. All participants were engaged in the scanning, either by pointing out structures or assisting with adjusting the knobs for the scanner so that every scan added skills for the entire small group.

Competency assessment

Competency was measured with a standardized skills assessment checklist across the scan types to assess probe handling, image acquisition, anatomical landmark identification, and pathology recognition. Certification required trainees to (1) operate the ultrasound machine independently (2) obtain diagnostic-quality image and (3) correctly identify ≥80% of key anatomical landmarks in at least four domains. Confidence levels were rated on a 5-point Likert scale before and after training.

Results

Confidence

Pre-training, all participants reported low confidence levels (mean score 2.1/5). Post-training, 85% (n=16) rated confidence levels of 4 or 5 in lung/abdominal scans, and 40% (n=7) did so for cardiac/cranial scans.

Competency and certification

Eighteen of 19 scored ≥80% on the practical skills assessment. Certification was awarded only to participants who met the set criteria. Certified participants demonstrated the ability to operate the ultrasound machine independently, recognize key anatomical landmarks, and identify common pathologies within each scan type. One participant was deferred for additional mentorship.

Post-Training Collaboration and Mentorship

Following the workshop, a network was established for image sharing and consultation among the participants and instructors. Participants began sharing de- identified cases and images via a collaborative online platform, which facilitated real-time feedback from instructors and peer learning. This network is anticipated to support skill retention and promote a culture of continual POCUS learning across the participating institutions.

Discussion

The training demonstrated that an intensive hands-on training is both feasible and impactful in Nigeria. The structured curriculum, real-time feedback, and hands-on experience ensured skills acquisition beyond just subjective confidence. While confidence surveys indicated variability, objective assessment revealed strong baseline skill acquisition (94.7% certification rate). The checklist-based assessment helped standardize certification. Cardiac scans appeared to be a persistent challenge, probably due to complex anatomy of the heart, and limited pre-training exposure.

For far-reaching impact, such training should be integrated in paediatric residency programs and scaled with support from teaching hospitals, Non-Governmental Organizations, and ministries of health in Nigeria. Access to compact, user-friendly ultrasound machines is crucial for reinforcing skills. In-service training for practicing paediatricians and neonatologists should be undertaken to improve their skills and output leading to overall safer and improved paediatric and neonatal care.

Long term skills retention should be assessed by future

longitudinal studies but providers will likely need ongoing refresher training and/or frequent use to maintain skills which can be supported by this and other ongoing collaboratives.

Conclusion

This eight-week NeoPOCUS training successfully enhanced both confidence and objectively assessed competency in neonatal ultrasound use. Our data also support integrating POCUS into Nigerian paediatric residency programmes, but highlight the need for: (a) standardized competency benchmarks; (b) longitudinal cardiac training; and (c) expanded access to ultrasound devices. The emerging network for ongoing mentorship and image sharing underscores the importance of collaborative support in maintaining and advancing POCUS skills in the field.

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