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CLINICAL ARTICLE

Evaluating a novel neonatal-care assessment tool among trained delivery attendants in a resource-limited setting

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ABSTRACT

Objective: To validate a novel objective structured clinical examination (OSCE) tool for assessing neonatal care skills among delivery attendants trained as part of the Essential Care for Every Baby (ECEB) program and to assess ECEB training effectiveness. *Methods:* Between August 1 and September 30, 2015, a cross-sectional study enrolled ECEB-trained healthcare providers who attended deliveries from the Brong Ahafo and Eastern regions of Ghana. Participants completed a previously developed 21-item OSCE tool that assessed neonatal-care competency. Participant performance was scored independently by regional trainers and national master trainers. The inter-rater scoring reliability was assessed using the Cohen kappa coefficient and performance was compared across participant characteristics. *Results:* The study enrolled 57 trained delivery attendants from 12 district hospitals. Inter-rater agreement was perfect (kappa 1.00) or almost perfect (kappa 0.81–0.99) for nine OSCE items, substantial (kappa 0.61–0.80) or moderate (kappa 0.41–0.60) for 11 items, and fair (kappa 0.21–0.40) for one item. Differences in OSCE-item performance were recorded based on participants' regions, facility type, age, and education level ($P<0.05$). *Conclusions:* In a resource-limited setting, the OSCE tool demonstrated substantial reliability and ECEB-trained healthcare practitioners exhibited satisfactory performance. The OSCE tool could be useful in similar settings and could have potential for up-scaled use in assessing neonatal-management skills.
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1. Introduction

Despite a decrease in mortality of one half among children younger than 5 years of age during the last 25 years, neonatal deaths within the first month of life remain a persistent problem. An estimated 2.9 million neonatal deaths occur each year, with neonatal deaths constituting an increasing percentage of all mortality among children aged younger than 5 years [1,2]. Over 98% of neonatal deaths occur in low- and middle-income countries, and the major causes remain prematurity, infections, and birth asphyxia [1]. The causes of neonatal death in Ghana, a lower middle-income country on the west coast of Africa, mirror these troubling statistics [3]. The 2014 Ghana Demographic and Health Survey reported that as many as 29 neonates die for every 1000 live deliveries [4]. Consequently, urgent interventions are needed to address this problem.

The Making Every Baby Count Initiative (MEBCI) is a 5-year partnership between the Ghana Health Service and PATH, and is funded by the Children's Investment Fund Foundation; it involves the provision of training for facility-based healthcare providers at both regional and district hospitals in four regions throughout Ghana (Brong Ahafo, Eastern, Volta, and Ashanti Regions). The aim of the MEBCI program is to improve neonatal health practices in Ghana through three main objectives: strengthening national leadership in neonatal health, strengthening the capacity to provide essential neonatal care at hospitals and sub-district facilities in four target regions, and strengthening the capacity to provide sustainable, high-quality neonatal care to address asphyxia, infection, and prematurity within selected regional hospitals.

In 2010, the American Academy of Pediatrics and partners introduced the Helping Babies Breathe (HBB) program. This curriculum,

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designed for neonatal resuscitation in low- and middle-income countries, emphasizes life-saving skills during the first minute of life, the so-called "Golden Minute" [5–8]. A subsequent curriculum, the Essential Care for Every Baby (ECEB) program, was introduced in 2014. Succeeding the end point of the HBB program, it trains providers, according to evidence-based clinical guidelines, in essential care practices necessary for all neonates once they are adequately breathing [9]. These curricula, together with infection-prevention and continuous quality-improvement programs, are the training components of MEBCI. Ghana was the first country to implement the ECEB program at scale.

Objective structured clinical examination (OSCE) tools have been demonstrated to be an effective method of assessing clinical-skill competence [10–12]. The ECEB training package includes two provider OSCE tools to assess trainee skills and the effectiveness of the training program [13]. However, whereas these tools have demonstrated early promise in settings with small numbers of trainees, a single, simplified OSCE was deemed necessary for assessing each trainee and for monitoring and evaluating national-level scale-up activities. Previously, a similar approach using a single-scenario OSCE has been developed and validated for large-scale implementation of the HBB program [14].

The main objective of the present study was to develop and validate, through inter-rater reliability measurements, a novel single-scenario OSCE tool for the first large-scale implementation of the ECEB training program, which took place in Ghana, and to assess ECEB training effectiveness through OSCE performance.

2. Materials and methods

From August 1 to September 30, 2015, a cross-sectional study enrolled trained health providers from regional and district hospitals in the Brong Ahafo and Eastern regions of Ghana. Healthcare providers from any cadre who attended deliveries and had completed ECEB training were considered eligible to participate; participants were birth attendants selected by their respective facilities and drawn from any health cadres in order to reflect as accurately as possible the diverse range of potential attendants known to be present at deliveries in Ghana [15]. The present study was approved by the institutional review board of Partners HealthCare (Massachusetts General Hospital, Boston, MA, USA) and the ethical review board of the Ghana Health Service. Informed consent was verbally obtained from all participants.

The OSCE tool evaluated was developed from the original two ECEB OSCE tools in a collaborative effort involving experienced clinicians and epidemiologists from Ghana Health Service, PATH, and Harvard Medical School [13]. Pilot testing of the new OSCE tool was performed among national master trainers to guide iterative refinements to the tool. The OSCE exercise was conducted with an inflatable neonate mannequin (NeoNatalie; Laerdal Foundation, Stavanger, Norway) that was used to simulate umbilical pulse and respiration. The 21-item assessment tool was designed to assess the ability of healthcare providers to deliver essential neonatal care and to address danger signs. Each item presented clearly defined scoring, resulting in a maximum total score of 28 points, with the items of greatest importance assigned more points. A score of 20–28 points was considered a "green" score, indicating that no immediate re-training was necessary and a score of 0–19 points placed a provider in the "red" category, indicating that further training was needed to achieve proper competency; providers who achieved red scores could then receive appropriate further training (Supplementary material S1).

All study participants underwent an examination incorporating the OSCE tool 4–8 weeks after completing ECEB training. The follow-up examinations were performed during on-site hospital visits at the healthcare facilities where the participants worked. Two evaluators–a regional trainer and a national master trainer–simultaneously and independently recorded OSCE scoring as participants successfully or unsuccessfully demonstrated the assessed skills on the training mannequin. Regional trainers were identified by the Ghana Health Service and included one or two nurses or midwives per region, and the national master trainers included two Ghanaian physicians (A.D.F. and N.S.). National master trainers had significant experience with the program and were regarded as the "gold-standard" scorers; the scores they assigned were considered to be controls, with the regional trainers' scores compared with them.

Data were analyzed using Stata version 14 (StataCorp, College Station, Texas, USA). The region of practice, facility type, gender, age, highest education level, health cadre, and number of years in practice were recorded for each participant. To assess performance, the proportion of participants providing correct responses was recorded for each OSCE item using the scores recorded by the national master trainers. Mean item scores and mean total OSCE scores were compared between different participant characteristics using the Student *t* test for binary variables and the analysis of variance for variables with more than two potential responses. $P<0.05$ was considered statistically significant and a Bonferroni-corrected *P* value was calculated for any variables that demonstrated significant differences. The Cohen kappa coefficient was used to compare the inter-rater reliability between the regional and national trainers [16]. The Cohen kappa coefficient was interpreted according to the following definitions: poor agreement (<0.00); slight agreement (0.00–0.20); fair agreement (0.21–0.40); moderate agreement (0.41–0.60); substantial agreement (0.61–0.80); almost perfect agreement (0.81–0.99); and perfect agreement (1.00) [16].

3. Results

The present study invited 57 delivery-attending healthcare providers from 12 facilities to participate; all of the providers agreed to participate and completed the OSCE. Of these participants, 41 (72%) were female and 48 (84%) had completed tertiary education. The mean age of participants was 35.7 years (range 24–58 years) and 24 (42%) of the participants were aged under 30 years. There were 44 (77%), a large majority, who had been practicing for shorter than 10 years (Table 1).

Table 1
Participant characteristics (n = 57).

Characteristic	No. (%)
Region	
Brong Ahafo	30 (53)
Eastern	27 (47)
Facility type	
Faith-based	37 (65)
Public/government	20 (35)
Gender	
Female	41 (72)
Male	16 (28)
Age, y [a]	
20–29	24 (42)
30–39	17 (30)
40–49	5 (9)
50–59	10 (18)
Highest education level completed [a]	
Middle school	2 (4)
Secondary	6 (11)
Tertiary	48 (84)
Health cadre [a]	
Health cadre 1 [b]	6 (11)
Health cadre 2 [c]	18 (32)
Health cadre 3 [d]	31 (54)
Health cadre 4 [e]	1 (2)
Practice experience, y [a]	
0–9	44 (77)
10–19	4 (7)
20–29	4 (7)
30–39	3 (5)
40–49	1 (2)

[a] Response unavailable for one participant.
[b] Medical officer or physician assistant.
[c] Enrolled nurse, general nurse, nurse, pediatric nurse, or anesthetist.
[d] Midwife, public health nurse/midwife, or principal midwifery officer/midwife.
[e] Ward assistant.

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