International Journal of Gynecology and Obstetrics 131 (2015) 196–200

Contents lists available at ScienceDirect

International Journal of Gynecology and Obstetrics

journal homepage: www.elsevier.com/locate/ijgo

CLINICAL ARTICLE

Validation of a novel tool for assessing newborn resuscitation skills among birth attendants trained by the Helping Babies Breathe program

Jonathan Reisman [a,b,*], Narra Martineau [a], Allan Kairuki [a], Victor Mponzi [c], Amunga R. Meda [a,d], Kahabi G. Isangula [a,e], Erica Thomas [c], Marya Plotkin [c], Grace J. Chan [b,f], Leila Davids [g], Georgina Msemo [h], Mary Azayo [h], Brett D. Nelson [a,b]

[a] Department of Pediatrics, Massachusetts General Hospital, Boston, MA, USA
[b] Department of Pediatrics, Harvard Medical School, Boston, MA, USA
[c] Jhpiego, Dar es Salaam, Tanzania
[d] Muhimbili National Hospital, Dar es Salaam, Tanzania
[e] Triangle Solutions, Dar es Salaam, Tanzania
[f] Division of Medical Critical Care, Boston Children's Hospital, Boston, MA, USA
[g] The Children's Investment Fund Foundation, London, UK
[h] Ministry of Health and Social Welfare, Dar es Salaam, Tanzania

ARTICLE INFO

Article history:
Received 8 December 2014
Received in revised form 6 May 2015
Accepted 24 July 2015

Keywords:
Birth asphyxia
Inter-rater reliability
Intrapartum-related complications
Low-income countries
Neonatal resuscitation
Newborn care
Objective structured clinical examination

ABSTRACT

Objective: To validate a simplified objective structured clinical examination (OSCE) tool for evaluating the competency of birth attendants in low-resource countries who have been trained in neonatal resuscitation by the Helping Babies Breathe (HBB) program. *Methods:* A prospective cross-sectional study of the OSCE tool was conducted among trained birth attendants working at dispensaries, health centers, or hospitals in five regions of Tanzania between October 1, 2013, and May 1, 2014. A 13-item checklist was used to assess clinical competency in a simulated newborn resuscitation scenario. The OSCE tool was simultaneously administered by HBB trainers and experienced external evaluators. Paired results were compared using the Cohen κ value to measure inter-rater reliability. Participant performance was rated by health cadre, region, and facility type. *Results:* Inter-rater reliability was moderate (κ = 0.41–0.60) or substantial (κ = 0.61–0.80) for eight of the OSCE items; agreement was fair (κ = 0.21–0.41) for the remaining five items. The best OSCE performances were recorded among nurses and providers from facilities with high annual birth volumes. *Conclusion:* The simplified OSCE tool could facilitate efficient implementation of national-level HBB programs. Limitations in inter-rater reliability might be improved through additional training.

1. Introduction

Helping Babies Breathe (HBB; http://www.helpingbabiesbreathe.org) is an evidence-based newborn resuscitation training program developed by the American Academy of Pediatrics and its partners to improve neonatal survival in low-resource settings [1–3]. The program teaches the essential skills of neonatal resuscitation and emphasizes the importance of having skilled personnel present at every birth. "The Golden Minute" (a term introduced in HBB) emphasizes adequate ventilation of newborns within the first 60 seconds of life.

In most countries, monitoring of HBB relies on two standardized objective structured clinical examinations (OSCEs) known as A and B [4]. OSCEs are widely used in health sciences to assess clinical competence and proficiency [5–7]. This method is especially effective in the evaluation of skills-based curricula and so plays a crucial part in the evaluation of birth attendant competence worldwide [1,2,8]. Implementation of an OSCE can, however, be resource-intensive owing to the need for materials, time, and sufficient training of evaluators. This issue poses substantial limitations in low-income and middle-income countries where the overwhelming majority of stillbirths occur, avoidable neonatal mortality is high, and an urgent need exists to improve neonatal resuscitation skills [9,10].

In response to high neonatal mortality rates in Tanzania, a partnership between the Tanzanian Ministry of Health and Social Welfare, the Children's Investment Fund Foundation, and Jhpiego (an affiliate of Johns Hopkins University, Baltimore, MD, USA), has been implementing the HBB program in this country since 2013 [11]. District-level trainers score the OSCEs of birth attendants who have undergone HBB training. Scores are used to assess proficiency and the need for remedial training. The availability of a streamlined OSCE with high levels of inter-rater

* Corresponding author at: Department of Pediatrics, Harvard Medical School, 55 Fruit Street, Bulfinch 015, Boston, MA 02114, USA. Tel.: +1 201 403 6307; fax: +1 201 641 0672.
E-mail address: reisman.jonathan@gmail.com (J. Reisman).

http://dx.doi.org/10.1016/j.ijgo.2015.05.019
0020-7292/

reliability could potentially assist scale-up of the HBB program both in Tanzania and in other low-income and middle-income countries.

The present study describes a new single-scenario OSCE tool that is based on the standardized A and B OSCE tools already used by the HBB program. The tool includes a restructured scoring system for training and evaluation of birth attendants in at-scale (i.e. national) HBB programs in Tanzania. The main objective was to measure inter-rater reliability of the tool as has been done previously with OSCEs that test trainee proficiency in various clinical disciplines [12–14].

2. Materials and methods

A prospective cross-sectional study of the OSCE tool was conducted among trained birth attendants in Tanzania between October 1, 2013, and May 1, 2014. Ethical approval for the present study was obtained from the Partners Human Research Committee (Massachusetts General Hospital, Boston, MA, USA) and the National Institute for Medical Research (Dar es Salaam, Tanzania). Written or verbal consent, as determined by the ethical review boards, was obtained from all participants.

As part of the national scale-up of the HBB program in Tanzania, a single-scenario OSCE tool was developed to measure the skills and knowledge of HBB-trained healthcare providers (Supplementary Material S1). The new OSCE tool was developed by experts from the Tanzanian Ministry of Health and Social Welfare, the Children's Investment Fund Foundation, Jhpiego, and other stakeholders. The OSCE tool comprises a single simulated birth scenario using HBB's standard newborn mannequin (NeoNatalie, Laerdal Foundation, Stavanger, Norway), an inflatable model that simulates respirations and umbilical pulse. The OSCE checklist includes 13 items considered essential in neonatal resuscitation, and points are awarded to providers for each successfully completed item. The items considered of greatest importance score 3 points, whereas those of lesser importance score 1 point. Total scores range from 0 to 23. Providers who achieve scores of at least 16 (equivalent to ≥70% correct and comparable to the American Academy of Pediatrics standardized HBB OSCE scoring) are rated in the "green" category, meaning that no further clinical mentoring is deemed necessary. Providers scoring 15 or lower (the "red" category) are assigned to receive further on-site clinical mentoring.

At the time of the present study, the HBB program had been rolled out in five of Tanzania's 25 regions (Dar es Salaam, Iringa, Lindi, Morogoro, and Pwani). These regions were chosen as a convenience sample and were considered generally representative of the target population. Birth attendants working in centers involved in HBB training in these regions underwent evaluation with the new OSCE tool 4–6 weeks after initial HBB training as part of the program's standardized follow-up schedule. All birth attendants undergoing follow-up evaluation during the present study period were included in the analysis. Participants were nurses, physicians, and medical assistants, reflecting the wide range of health cadres involved in the care of newborns within Tanzania's healthcare system [15]. They worked in dispensaries, health centers, or hospitals (district hospitals, faith-based hospitals, regional hospitals, and referral hospitals).

Healthcare providers undergoing follow-up evaluation with the new OSCE tool were visited on-site, where they were simultaneously and independently scored by two evaluators: a district-level trainer and an external evaluator. As part of the HBB program, district-level trainers comprised one or two experienced nurses or midwives per district, who were chosen by the Tanzanian Ministry of Health and Social Welfare to undergo HBB master training as well as standardized training in OSCE implementation. The scores awarded by the external evaluators were considered the control for the present study and used to evaluate the accuracy of the district-level trainers' scores. The external evaluators (three Tanzanian physicians) were recruited, interviewed, and selected by field researchers from Harvard Medical School, Boston, MA, USA. They underwent a 2-day training course on OSCE administration, which included numerous simulated and actual OSCE administrations until scoring was deemed consistent and accurate.

Data were analyzed using SPSS version 22 (IBM, Armonk, NY, USA). The external evaluators' scores were used to identify associations between provider OSCE performance and health cadre, region, and health facility level. For each of these provider characteristics, descriptive analyses identified mean scores and standard deviations. Paired *t* tests were performed to generate a difference of the mean scores for each OSCE item. The 95% confidence intervals were used to determine *P* values. $P < 0.05$ was considered statistically significant.

The Cohen κ statistical measure was used to compare the inter-rater reliability between district-level trainers and external evaluators [16]. The κ value lies on a scale from −1.0 to 1.0 and measures the level of agreement between two or more independent raters not attributable to chance. A value of 1.0 suggests perfect agreement, whereas values of 0.0 or lower suggest that agreement is the result of chance or less than chance (i.e. a negative association) [17]. The following definitions were used for κ value interpretation: 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); and almost perfect agreement (0.81–0.99) [18].

3. Results

A total of 313 birth attendants were assessed during the present study period. In all, 34 OSCEs were excluded owing to incomplete data; 279 OSCEs were included in the final analysis. Assessment took place at 82 facilities in five regions of Tanzania, with dispensaries accounting for 125 (44.8%) and hospitals for 100 (35.8%) OSCEs. This distribution was not representative of Tanzania as a whole: nationally, dispensaries comprise 86% and hospitals 4% of all healthcare facilities [19]. Most participants were nurses or medical attendants (Table 1).

Total OSCE scores given by external evaluators ranged from 5 to 23, with a mean value of 16.2 ± 3.9. In all, 177 (63.4%) participants scored at least 16 points (green category), with the other 102 (36.6%) scoring 15 points or lower (red category). Most providers initiated ventilation within 60 seconds of delivery and ventilated at 40 breaths per minute (Table 2). A total of 222 (79.6%) providers correctly performed one or

Table 1
Characteristics of participants (n = 279).

Characteristic	No. (%)
Region	
Dar es Salaam	46 (16.5)
Iringa	62 (22.2)
Lindi	55 (19.7)
Morogoro	57 (20.4)
Pwani	59 (21.1)
Facility type	
Dispensary	125 (44.8)
Health center	54 (19.4)
Hospital[a]	100 (35.8)
Birth attendant skill level[b]	
Health cadre 1 [c]	15 (7.2)
Health cadre 2 [d]	30 (14.4)
Health cadre 3 [e]	105 (50.5)
Health cadre 4 [f]	58 (27.9)
Time elapsed since HBB training, d	
<30	44 (15.8)
30–39	46 (16.5)
40–49	154 (55.2)
≥50	35 (12.5)

Abbreviation: HBB, Helping Babies Breathe.
[a] District hospitals, faith-based hospitals, regional hospitals, and referral hospitals.
[b] Data available for 208 participants.
[c] Medical doctor, medical officer, or assistant medical officer.
[d] Clinical officer or assistant clinical officer.
[e] Registered nurse, enrolled nurse, or nurse officer.
[f] Public health nurse, maternal and child health assistant, or medical attendant.