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Simulation and education

Evaluating the effectiveness of a strategy for teaching neonatal resuscitation in West Africa☆

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ABSTRACT

Aim: To evaluate the effectiveness of a strategy for teaching neonatal resuscitation on the cognitive knowledge of health professionals who attend deliveries in Ghana, West Africa.
Methods: Train-the-trainer model was used to train health professionals at 2–3 day workshops from 2003 to 2007. Obstetric Anticipatory Care and Basic Neonatal Care modules were taught as part of Neonatal Resuscitation Training package. American Neonatal Resuscitation Program was adapted to the clinical role of participants and local resources. Cognitive knowledge was evaluated by written pre- and post-training tests.
Results: The median pre-training and post-training scores were 38% and 71% for midwives, 43% and 81% for nurses, 52% and 90% for nurse anaesthetists, and 62% and 98% for physicians. All groups of the 271 professionals (18 nurse anaesthetists, 55 nurses, 68 physicians, and 130 midwives) who completed the course showed significant improvement ($p < 0.001$) in median post-training test scores. Midwives at primary health care facilities were less likely to achieve passing post-test scores than midwives at secondary and tertiary facilities [35/53 vs. 24/26 vs. 45/51 ($p = 0.004$)] respectively.
Conclusion: Evidence-based neonatal resuscitation training adapted to local resources significantly improved cognitive knowledge of all groups of health professionals. Further modification of training for midwives working at primary level health facilities and incorporation of neonatal resuscitation in continuing education and professional training programs are recommended.
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1. Introduction

Perinatal asphyxia, a potentially modifiable cause of neonatal mortality and morbidity affects over four million newborns in developing countries annually. About 1.2 million of affected infants die and at least the same number develop severe consequences such as cerebral palsy.[1,2] Perinatal asphyxia is a major cause of neonatal mortality in Ghana.[3–6]

Improving neonatal resuscitation skills of health professionals reduces neonatal mortality and morbidity.[7,8] However, health professionals in sub-Saharan Africa feel professionally inadequate to provide neonatal resuscitation because they lack adequate knowledge, skills, and basic equipment for emergency perinatal care.[9,10] These barriers could be reduced with training.

The American Academy of Paediatrics (AAP) and American Heart Association (AHA) Neonatal Resuscitation Program (NRP) is an effective training tool for improving knowledge and skills of health professionals,[11,12] and the standard of care for preventing adverse outcome in asphyxiated newborns.[13] Neonatal resuscitation training programs are non-existent in many west African countries. To improve the knowledge and skills of health professionals who care for the newborn, we started multi-component workshops in Ghana in 2003. We report the strategy used to implement training and the effect of training on cognitive knowledge.

2. Methods

The workshops were organized by Department of Child Health, Korle Bu Teaching Hospital (KBTH), Accra from October 2003 to September 2007. Each workshop lasted 2–3 days and comprised of 3 modules: (a) Obstetric Anticipatory Care for identifying the foetus at risk, (b) Basic Neonatal Care based on the World Health Orga-

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Table 1
Place of work of health professionals.

	Tertiary level health facility	Secondary level health facility	Primary level health facility
Mid wives (n = 130)	51	26	53
Nurse (n = 55)	20	35	–
Nurse anaesthetists (n = 18)	–	18	–
Physicians (n = 68)	46	22	–
Total	117	101	53

Table 2
Neonatal Resuscitation Program (NRP) median (interquartile range) test scores of participants.

	Mid wives (n = 130)	Nurse (n = 55)	Nurse anaesthetists (n = 18)	Physicians (n = 68)
NRP tests (maximum score)				
Pre-test (21)	8 (7–11)	9 (7–12)	11 (10–13)	13 (12–15)
Lesson 1 (13)	8 (7–10)	10 (8–11)	9.5 (8–10)	11(10–12.5)
Lesson 2 (13)	7 (6–9)	9 (7–11)	10 (9–11)	10 (8–11)
Lesson 3 (19)	11 (9–13)	12 (11–14)	13 (12–14)	14(10.5–16)
Lesson 4 (14)	11 (8–13)	12 (12–13)	12 (10–13)	12(8.5–14)
Lesson 5 (13)	–	–	–	12 (11–13)
Lesson 6 (13)	–	–	–	12 (10–13)
Lesson 7 (13)	–	–	–	–
Post-test (21)	15 (13–17)	17 (15–19)	19 (17–19)	20.5 (19–21)

nization (WHO) Integrated Management of Childhood Illnesses and Essential Newborn Care Program, and (c) Neonatal Resuscitation based on the fourth edition of the AAP/AHA NRP.[14] Training comprised of didactic lectures, interactive and hands-on practical sessions, and train-the-trainer model for neonatal resuscitation module.

2.1. Participants and instructors

Participants were midwives, nurses from acute obstetric and neonatal units, residents in obstetrics and paediatrics, medical officers in secondary level health facilities, and nurse anaesthetists. Each workshop had 30–50 participants. The first workshop was conducted by volunteer neonatal resuscitation training instructors from United States of America (USA). They provided training equipment and trained 10 trainers. These 10 trainers (2 nurses and 8 physicians) from KBTH formed the core trainers for subsequent workshops.

2.2. Neonatal resuscitation training module

We taught the seven lessons of NRP [(i) principles of resuscitation; (ii) initial steps in resuscitation; (iii) bag and mask ventilation; (iv) chest compressions; (v) endotracheal intubation; (vi) medications; (vii) special considerations], but minimized emphasis on endotracheal intubation and medications for nurses and midwives. The Special Considerations lesson was adapted to local context. We ensured comprehension of the subject by: (a) teaching a maximum of two lessons per day to nurses and midwives and spending more time on practical sessions; (b) discussion of test questions for each lesson after presentation and evaluation of that lesson; and (c) extra tutorial for participants with unsatisfactory practical skills.

2.3. Evaluation of effect of training on cognitive knowledge and practical skills

The NRP evaluation multiple choice and fill-in questions were administered for each lesson taught. The results of the 21-question pre- and post-tests which cover all aspects of the module were used to assess change in cognitive knowledge. Physicians were taught the entire NRP and the passing score was 85% which is consistent with the NRP in USA. We defined passing score among non-physicians as 60%; this is equivalent to 85% of the pre- and post-test questions relating to lessons they had formal presentations on. Practical skills were assessed by direct observation of mock clinical scenarios using a performance checklist. However, effect of training on practical skills was not analysed because it was logistically difficult to do it formally on all participants.

2.4. Statistical analysis

Data were analysed with Sigma Stat for Windows Version 3.11 (Systat Software Inc., USA). We used Wilcoxon signed rank test to compare the difference between pre- and post-test scores for health professional groups, and Chi-square analysis to compare the performance of midwives at different health facility levels.

3. Results

Of the 314 participants at 7 workshops; 271 (18 nurse anaesthetists, 55 nurses, 68 physicians, and 130 midwives) completed the lessons. We excluded 43 participants (28 physicians and 14 midwives from KBTH, and 1 nurse from secondary health facility) who partially attended the workshops. Most (38/43) excluded participants had to leave the workshop to attend emergencies. Table 1 shows the levels of health facilities of participants. Most midwives

Table 3
Improvement in health professional pre- and post-test scores after Neonatal Resuscitation Program training.

	Median pre-test score % (IQR)	Median post-test score% (IQR)	Median improvement from pre-test (%)	p-value
Status				
Midwives (n = 130)	38 (33–52%)	71 (62–81%)	87	<0.001
Nurses (n = 55)	43 (33–57%)	81 (71–90)	89	<0.001
Nurse anaesthetists (n = 18)	52 (48–62%)	90 (81–90)	72	<0.001
Physicians (n = 68)	62 (57–71%)	98 (81–98%)	58	<0.001

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