African Journal of Emergency Medicine 10 (2020) 107–110

Contents lists available at ScienceDirect

African Journal of Emergency Medicine

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

ORIGINAL ARTICLE

The state of emergency medical technician education in Ghana

Katelyn E. Flaherty[a], Ahmed N. Zakariah[b], Vicki A. Vescio[c], Maxwell Osei-Ampofo[d], Mohammed-Najeeb Mahama[b], Vitus Agongo[b], Torben K. Becker[e,*]

[a] College of Medicine, University of Florida, Gainesville, FL, USA
[b] National Ambulance Service, Ministry of Health, Accra, Ghana
[c] School of Teaching and Learning, University of Florida, Gainesville, FL, USA
[d] Emergency Medicine Directorate, Komfo Anokye Teaching Hospital, Kumasi, Ghana
[e] Department of Emergency Medicine, University of Florida, Gainesville, FL, USA

ARTICLE INFO

Keywords:
Prehospital care
Experiential learning
Simulation
Emergency medical technician
Education

ABSTRACT

Objective: The National Ambulance Service (NAS) provides emergency medical services throughout Ghana and trains emergency medical technicians (EMTs) at the NAS Prehospital Emergency Care Training School (PECTS). Currently the majority of EMT training occurs primarily in a traditional didactic format. Students and faculty were interviewed to better understand their views of the current curriculum. Additionally, any barriers to integration of simulation-based learning were assessed. Following the interviews, the faculty was trained to conduct obstetric and neonatal simulations. The faculty was then observed introducing the simulations to the EMT students.

Methods: A standardized list of questions developed in consultation with an education expert was used to elicit student and faculty expression of opinion. Interviews were conducted in-person in small group settings. Training sessions were conducted in-person in large group settings.

Results: Students and faculty alike expressed pride in their work and 14/25 groups felt that teaching efforts were high. However, students verbalized concern involving their lack of rest (12/18) and the high volume of lectures per day (11/18). Both students and faculty felt limited by the lack of simulation tools (17/25), library resources (14/25), internet access (17/25), and infrastructure (20/25). All groups felt favorably towards the integration of simulation-based learning (25/25).

Conclusion: The faculty and students of PECTS support the transition from a curriculum based on traditional didactic learning to one based on simulation learning.

African relevance

- Reports the opinions of African Emergency Medical Technician students and facilitators at the Ghanaian Pre-hospital Emergency Care Training School
- Seeks to identify the barriers to experiential learning in Africa
- Considers the medical and educational resource limitations in Africa

Introduction

In 2004 the National Ambulance Service (NAS) was established to fill the need for emergency medical services in the Republic of Ghana. Started as a pilot project, the NAS provides prehospital emergency care across the nation [1,2]. The NAS began as a pilot operation with 69 Basic Emergency Medical Technicians (EMTs) and has grown to include a Prehospital Emergency Care Training School (PECTS) to train future generations of NAS Basic and Advanced Emergency Medical Technicians [3]. PECTS offers a one-year Basic EMT Training Program for students with a high school-level degree as well as a two-year Advanced EMT Training Program for students with a college-level degree. Each year includes six months of classroom learning at PECTS, three months of hospital experience, and three months of ambulance station and field experience. The classroom education is delivered by a combination of resident Advanced EMT faculty, visiting emergency physicians and topic matter experts [3].

PECTS operates as a paramilitary program on an isolated campus in a rural area of the Ashanti Region. Table 1 illustrates a typical daily schedule. Fatigue refers to a period of campus maintenance which often involves weeding. Tattoo refers to an overnight period in which a bell may be rung up to 7 times signaling students to get out of bed and into

* Corresponding author.
E-mail address: t.becker@ufl.edu (T.K. Becker).

https://doi.org/10.1016/j.afjem.2020.01.009
Received 15 October 2019; Received in revised form 17 December 2019; Accepted 29 January 2020
Available online 07 March 2020

Table 1
Typical daily schedule at PECTS.

5:00–6:00 AM	Physical Fitness or Drill
6:00–7:00 AM	Physical Fitness or Drill
7:00–8:00 AM	Breakfast
8:00–11:30 AM	Classes
11:30–1:00 PM	Lunch
1:00–4:00 PM	Classes
4:00–6:00 PM	Fatigue
6:00–7:00 PM	Dinner
7:00–10:00 PM	Studies
10:15–night	Tattoo

formation.

We sought to determine the strengths and weaknesses of this curricular model and identify opportunities to improve the practicality of the program with simulation learning. Additionally, we sought to pilot implementation of a simulation module at PECTS. This work is intended to drive future research regarding practical EMT training in Ghana.

Methods

Site and participants

Focus group discussions and simulation sessions were held at PECTS over a four-day period with Basic EMTs, Advanced EMTs, and permanent faculty.

Evaluation of current system

Interviews

Each focus group was led by a single interviewer with training by an educational expert in qualitative research and previous experience interviewing. All interviewees were asked a standard set of questions (Table 2). These questions were developed in consultation with our qualitative research expert and vetted by our Ghanaian partners at the NAS through a group consensus process.

Interview questions were semi-structured to encourage participants to expand on their ideas and speak beyond the questions. No time limit was set, although the focus group interview sessions lasted, on average, 30 min. All interviews were temporarily recorded and then transcribed.

Analysis

For analysis of the focus group data, we categorized concepts into themes through consensus with final approval by the qualitative research expert on our team. Mentions of each theme by the Basic EMTs, Advanced EMTs, and faculty were enumerated independently.

Pilot implementation of simulation module

Train the trainer

One large group session was held to familiarize the faculty with new neonatal and obstetric simulation equipment, Laerdal's NeoNatalie and MamaBirthie. NeoNatalie can be used to practice listening for neonatal cries, feeling the umbilical pulse, listening for fetal heartbeat, checking for respirations, conducting neonatal CPR, and ventilating with a bag-valve-mask device. MamaBirthie allows practice in conducting a vaginal examination, placing a urinary catheter, delivering the baby, delivering the placenta, and cutting the umbilical cord. Faculty members were shown how to use this equipment to conduct simulation scenarios. In groups of two, the faculty played the roles of EMTs and carried out simulations ranging from basic healthy births to obstetrical complications, such as breech presentation or shoulder dystocia, and neonatal resuscitation. In each scenario a backstory was provided regarding the simulated patient and patient's family. Faculty was encouraged to design similar scenarios with the help of instructional videos provided by Laerdal to teach the students obstetrics and neonatology the following day.

Lesson observation

Faculty was observed designing simulation scenarios and introducing the Laerdal equipment to the students. The simulations were directly observed by a researcher uninvolved in the modules. The observing researcher took notes on student reactions and level of engagement, and then partnered with faculty to lead a formal feedback session following each module. The formal feedback period consisted of 10 min when faculty and students alike were encouraged to openly share their thoughts on the simulation with each other and research team.

Ethics

This project was reviewed by the Institutional Review Board of the University of Florida and was approved with a waiver of written informed consent.

Results

Evaluation of current system

Eleven groups of five Basic EMTs, seven groups of five Advanced EMTs and seven groups of one-to-three faculty members participated in focus group discussions. The total number of people interviewed was 106 over the 25 focus groups.

Among the 25 interview groups several themes were identified (Table 3).

Table 2
Interview questions.

	Student questions	Faculty questions
Goal: Explore views of the current educational approach/methods	What are the perceived positives and negatives of the way your classes are currently taught?	What are the perceived positives and negatives of the teaching curriculum?
	In what ways do resource-limitations impact your ability to learn?	In what ways do resource-limitations impact your ability to teach?
	When you enter the field after completing the curriculum, what are your thoughts on how well you will be prepared for the emergency situations you face? Rate on a scale of 1–10.	When trainees enter the field after taking classes what are your thoughts on how well they are prepared for their work? Rate on a scale of 1–10.
	In what ways do you think your training could be improved?	In what ways do you think the curriculum could be improved?
Goal: Explore thoughts on simulation training	What is your current understanding of simulation or experiential training?	
	What are your current opinions on simulation or experiential training?	
Goal: Understand cultural barriers to a simulation-based curriculum	Do you see limitations or cultural barriers to using a simulation-based curriculum in EMT training?	
Goal: Assess areas of educational need	What do you see as the greatest areas of need for more practical training relating to specific medical topics?	
	What do you see as the greatest area of need for more training relating to skills beyond specific medical topics?	

Table 3
Themes identified through interviews with students and faculty at the PECTS.

		Basic EMTs n = 11 groups	Advanced EMTs n = 7 groups	Faculty n = 7 groups
Perceived positives of the curriculum	Teaching efforts by faculty	7	5	2
	Hospital and Ambulance Rotations	6	3	1
Perceived negatives of the curriculum	Delayed lecture slide printouts	3	4	7
	Alarm drills during night	7	5	0
	High number of daily lectures	5	6	0
	Large class size	6	0	4
Resource concerns (lack of access to)	CPR manikins	5	6	6
	AED task trainers	3	4	1
	Library books	5	7	2
	Internet	6	7	4
	Infrastructure including toilets, classrooms, and dormitories	11	4	5
Opinions on simulation	Favorable	10[a]	7	7
Perceived cultural barriers to simulation learning	English language	0	1	3
Identified areas of need for practical training	Trauma response including splinting and managing bleeding	2	3	7
	Resuscitation including CPR, defibrillation, and airway	7	2	3
	Communication and teamwork	11	7	7

[a] One Basic EMT group had no understanding of simulation learning.

Preparedness rankings varied greatly by individual; however, in general, Basic EMTs felt they will be very highly prepared at graduation, while Advanced EMTs felt that they themselves will be well prepared and Basic EMTs less so. Faculty ranked the students slightly lower than either group ranked themselves. Among all groups, the lowest ranking was a 5 and the highest ranking was a 10.

Pilot implementation of simulation module

The observing researcher noted high engagement from students and faculty during the pilot simulation exercise. The students willingly volunteered to participate in the simulations. Those playing patients acted animatedly and those playing EMTs approached the situation with the appropriate amount of realism and gravity. Faculty members introduced each simulation exercise and narrated throughout. As the session progressed, the faculty began to add novel elements to the simulation scenarios.

After each simulation, the faculty led a group discussion to reflect on performance. Students vocalized their belief that this type of education would increase their confidence, communication, and technical skills in the field.

Discussion

Simulation-based learning has been found to be effective in low- and middle-income countries (LMICs). It has been found to improve specific surgical skills [4,5] as well as obstetric skills [6–9]. Short-term simulation interventions in obstetrics have been found to improve eclampsia care [8], bimanual compression [9], and respect for the mother [6] as measured by practical assessments [8,9] and patient surveys [6]. Specifically, simulated births have been shown to increase nursing students' efficient adherence to evidence based practices in response to pre-eclampsia and eclampsia in India [8]. Similarly, uterine simulators have been proven to improve birth attendants' ability to perform bilateral compression of the uterus in response to postpartum hemorrhage in Ghana [9]. These studies, like most, focused on a particular skill and not patient-oriented outcomes. However, other studies have proven that more widespread simulation education in obstetric emergencies can lower maternal mortality [7]. In addition to obstetric emergencies, road traffic accidents and other forms of trauma dominate the call pattern for NAS ambulances. Therefore, NAS leadership has expressed an interest in dedicated prehospital trauma simulation training. Nonetheless, the evidence base for simulation training in the field of prehospital trauma training is more limited. While trauma courses including simulation components have been found to improve assessment scores [10] in LMICs, there is little data regarding the effects of trauma simulations on clinical outcomes. However, in a needs assessment for prehospital care in Botswana 85% of prehospital personnel rated training for penetrating trauma high priority or essential and 18% of EMS calls involved traumatic injuries [11]. Thus, given the prevalence and severity of motor vehicle collisions in Ghana [12], there is a similar need for high-quality prehospital trauma care. Future studies may analyze the effects of a trauma simulation curriculum at PECTS on clinical measures.

At this time, there exist no data describing the efficacy of large-scale, long-term curricular change from didactic to experiential learning in LMICs. Furthermore, there is little research describing the efficacy of simulation-based learning among students in LMICs.

Nonetheless, the multifaceted factors faced in prehospital emergency care that encompass medical knowledge, invasive procedural skills, team dynamics, scene safety, and effective communication with patients, their families, bystander and other healthcare professionals demand particular attention in training. Experiential learning can serve as a model to comprehensively address these unique challenges. Given preliminary reports of successful small-scale simulation interventions among junior-level surgical trainees [4], implementation of simulation-level training even for entry level students is likely to be effective.

Our report demonstrates that EMT students and faculty alike are open to the integration of simulation-based learning at PECTS. Furthermore, all parties have proven themselves capable of enacting such change.

Our results are not without limitations. Many interview questions had to be rephrased multiple ways depending on the English language skills within the group. Quieter students with lesser English skills may have felt overpowered. In addition, the faculty's vocal opinions favoring simulation learning may have impacted student responses.

Further research is necessary to elucidate the negative impact of the nightly alarm drills, large class sizes, and resource limitations. Moving forward, changes may be warranted to address these concerns.

Several other concerns were raised during the focus group sessions. Many student groups expressed frustration with public perception of EMTs as hearse drivers and the lack of EMT malpractice insurance in Ghana. These topics should also be considered for future exploration.

The results of this work were shared with NAS leadership and we collectively recommend expansion of the simulation curriculum at PECTS. We do not anticipate any significant cultural barriers; however financial need and resource limitations remain the primary challenges.

In conclusion, the students and faculty spoke favorably about and reacted enthusiastically to the integration of simulation-based learning at PECTS. There is an opportunity for future research concerning the

effects of large-scale, long-term curricular change towards experiential learning within the NAS.

Dissemination of results

Results from this study were shared with the CEO of the National Ambulance Service through a formal meeting in Accra, Ghana. The results were also emailed to the administrators of the Prehospital Emergency Care Training School.

Author contribution

Authors contributed as follows to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: KF and TKB contributed 40% each; ANZ and VAV contributed 6% each; MOA 4%, and MNM and VA contributed 2% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of competing interest

Dr Maxwell Osei-Ampofo is an editor of the African Journal of Emergency Medicine. Dr Osei-Ampofo was not involved in the editorial workflow for this manuscript. The African Journal of Emergency Medicine applies a double blinded process for all manuscript peer reviews. The authors declared no further conflicts of interest.

References

[1] Zakariah A, Stewart BT, Boateng E, Achena C, Tansley G, Mock C. The birth and growth of the National Ambulance Service in Ghana. Prehosp Disaster Med 2017;32(1):83–93.

[2] Osei-Ampofo M, Oduro G, Oteng R, Zakariah A, Jacquet G, Donkor P. The evolution and current state of emergency care in Ghana. African Journal of Emergency Medicine 2013;3:52–8.

[3] Martel J, Oteng R, Mould-Millman NK, Bell SA, Zakariah A, Oduro G, et al. The development of sustainable emergency care in Ghana: physician, nursing and Prehospital care training initiatives. J Emerg Med 2014;47(4):462–8.

[4] Tansley G, Bailey JG, Gu Y, Murray M, Livingston P, Georges N, et al. Efficacy of surgical simulation training in a low-income country. World J Surg 2016;40(11):2643–9.

[5] Okrainec A, Smith L, Azzie G. Surgical simulation in Africa: the feasibility and impact of a 3-day fundamentals of laparoscopic surgery course. Surg Endosc 2009;23(11):2493–8.

[6] Afulani PA, Aborigo RA, Walker D, Moyer CA, Cohen S, Williams J. Can an integrated obstetric emergency simulation training improve respectful maternity care? Results from a pilot study in Ghana. Birth. 2019;46(3):523–32.

[7] Pattinson RC, Bergh AM, Ameh C, Makin J, Pillay Y, Van den Broek N, et al. Reducing maternal deaths by skills-and-drills training in managing obstetric emergencies: a before-and-after observational study. S Afr Med J 2019;109(4):241–5.

8. Raney JH, Morgan MC, Christmas A, Sterling M, Spindler H, Ghosh R, et al. Simulation-enhanced nurse mentoring to improve preeclampsia and eclampsia care: an education intervention study in Bihar, India. BMC Pregnancy Childbirth [Internet]. 2019; 19. Available from: doi:https://doi.org/10.1186/s12884-019-2186-x.

[9] Andreatta P, Gans-Larty F, Debpuur D, Ofosu A, Perosky J. Evaluation of simulation-based training on the ability of birth attendants to correctly perform bimanual compression as obstetric first aid. Int J Nurs Stud 2011;48(10):1275–80.

[10] Bergman S, Deckelbaum D, Lett R, Haas B, Demyttenaere S, Munthali V, et al. Assessing the impact of the trauma team training program in Tanzania. J Trauma 2008;65(4):879–83.

[11] Glomb NW, Kosoko AA, Doughty CB, Rus MC, Shah MI, Cox M, et al. Needs assessment for simulation training for prehospital providers in Botswana. Prehosp Disaster Med 2018;33(6):621–6.

[12] Damsere-Derry J, Palk G, King M. Road accident fatality risks for “vulnerable” versus “protected” road users in northern Ghana. Traffic Inj Prev 2017;18(7):736–43.