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RESEARCH ARTICLE

ENHANCING MEDICAL STUDENTS' COMPETENCY IN EMERGENCY MEDICINE RELATED SKILLS BY BOOT CAMP TRAINING IN LOW RESOURCE AREA

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ABSTRACT

Introduction: Emergency Medicine EM is experiencing significant growth in graduate medical education. In undergraduate programs emergency medicine-related competencies in medical school curricula may lack uniformity and standardization. In developing countries like Sudan, teaching EM faces many challenges including lack of standardized curricula, well designed learning methods and scarcity of faculty with EM background. Introduction of boot camp training during career transition period may enhance trainees' clinical skills, knowledge, and confidence.

Methods: Eight days boot camp was designed to enhance the skills of final year medical student. The camp was divided into two sets of tour days. The first four days for didactic and scenario based classroom teaching. The other four days were organized in skills lab. Training was designed to improve the skills related to immediate life support for adult and pediatrics, trauma management and ECG workshop. Participants were surveyed before and after the boot camp by self-administered questionnaire.

Results: The total number of the students was82. Rate of response to questions was variable, ranging from 74-93.3%. Responses to pretest were less than post-test. Tow third of the participant were female. Age ranged from 22.6-27, with the mean age of 23.4. Among the 25 items surveyed, students reported statistically significant improvement in competency in all items.

Conclusion: Boot camp training significantly improved the skills of the final years medical students as measured by self-reported competency. Designing boot camp is a challenging process and requirres measurring baseline status and future benchmarks.

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INTRODUCTION

Emergency Medicine (EM) is relatively a new specialty compared to other disciplines. EM is experiencing significant growth in graduate medical education (The national resident matching program, 2015). Undergraduate programs are incorporating EM experiences in their curricula slowly (Wald *et al*., 2010). EM-related competencies in medical school curricula may lack uniformity and standardization (Manthey *et al*., 2010). Medical schools may offer EM experiences, but these may have wide variability in goals, settings, focus, and learning methods. There are growing concerns regarding the variability of skills and lack of preparedness of incoming residents (Lyss-Lerman *et al*., 2009). During medical education trainee experience transitional points in the educational process. The most critical one is the transition from medical student to junior doctor. This one dictates integration of knowledge and critical skills (Minha *et al*., 2016). Many of the interns realizes a disconnection between their academic knowledge of medicine and its clinical application in team based setting, and reported a sense of unpreparedness (Minha *et al*., 2016) Sudan and other developing countries face many obstacles to establish a good Emergency Medical System (EMS) (L.M *et al*., 2015). These obstacles include; lack of financial support, lack of specialist physicians and technicians,

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negative views of other physicians, and deficiency in structured training in EM in medical schools (A-Rahman and Jacquet, 2014). Teaching EM faces many challenges including lack of standardized curricula, well designed learning methods and scarcity of faculty with EM background (Abdalrahman *et al*., 2017). It is expected from fresh graduate to deal with common medical problems and handle a variety of medical emergencies with variable degrees of supervision and delegation (Abdalrahman *et al*., 2017). The situation calls for an immediate action to meet the public needs. This may call for alternative way of teaching and learning. Inter-professional education through simulation based education and boot camp courses had proved their effectiveness as learning methods for medical students as well as for junior physicians (Broaddus, 2013; Baker *et al*., 2008). Boot camps defined as: ''A focused course designed to enhance learning, orientation, and preparation for learners entering a new clinical role. This is achieved through the use of multiple educational methods with a focus on deliberate practice with formative feedback.'' (Blackmore *et al*., 2014). Introduction of boot camp courses during career transition periods in clinical training may enhance trainees' clinical skills, knowledge, and confidence (Blackmore *et al*., 2014; Naritoku *et al*., 2014). Two recent meta-analyses across all clinical disciplines (including EM) have demonstrated that when compared with no intervention or baseline performance, simulation has large effects on outcomes of knowledge, skills, and behavior, and moderate effects on patient-related outcomes (Ilgen *et al*., 2013).

In emergency rooms, residents and front - liners should be prepared with sets of competencies enabling them to manage acutely and critically ill patients. Abdalrahman *et al* reported lack of clinical competencies in many skills among medical graduates in Sudan (Abdalrahman *et al*., 2017). As an intervention we designed 8 days boot camp training in emergency medicine for final year medical school. We measure self-reported competency of participants before and after the boot camp.

MATERIALS AND METHODS

In order to improve students' performance in emergency medicine related competency, we designed boot camp for final year medical students from faculty of medicine at Alneelain University, Khartoum, Sudan. The boot camp leaders and designers were 2 consultants in critical care. They recruited 6 instructors who were certified in teaching Advance Life Support (ALS), Fundamental Critical Care Support (FCCS) and Advance Trauma Life Support (ATLS). The curriculum was executed in 8 days, four days for didactic and scenario based classroom teaching. The other four days were organized in skills lab. The practical was composed of four themes, including; adult immediate life support (ILS), Pediatrics Immediate Life Support (PILS), BasicTrauma Support and ECG workshop. In ILS and PILS stations were designed to demonstrate ABCDE approach; working in a team;recognize and prevent cardiac arrest; perform CPR, execute basic airway and oxygenation management and implement valve mask ventilation. In the trauma workshop we demonstrated primary and secondary survey, regional trauma management with special emphasis on skills required by fresh graduate. For example they are not credentialed to place chest tube, but they are required to monitor the function and output of the tube. ECG workshop covered ECG interpretation, rhythm recognition and response, delivering cardioversion and ECG-based approach to acute coronary syndrome. The practical training was conducted at Soba Education, Training and Examination Center. Participants were surveyed before and after the boot camp by self-administered questionnaire. Written test was administered for ILS, PILS and trauma. Formative assessment was done during each skill station and for the ECG workshop.

RESULTS

The total number of the students was 82. Rate of response to question was variable, ranging from 74-93.3%. Responses to

Table 1. Students' competency before and after boot camp training

	Pre training			Post training			
Item	Poor	average	Above average	poor	average	Above average	P value
Assessment of acutely ill	28 (44.4%)	26 (41.3%)	9 (14.3%)	1 (1.3%)	9 (11.7%)	66 (85.5%)	0.000
Using early warning score to recognize critically ill	51 (81.0%)	9 (14.3%)	3 (4.8%)	3 (3.9%)	14 (18.2%)	60 (77.6%)	0.000
Recognition of threatened ariway	37 (58.7%)	17 (27.0%)	7 (11.1%)	1 (1.3%)	8 (10.4%)	68 (88.3%)	0.000
Head tilt chin lift	27 (42.9%)	25 (39.7%)	11 (17.5%)	1 (1.3%)	3 (3.9%)	73 (94.8%)	0.000
Using airway devices	49 (77.8%)	12 (19.0%)	2 (3.2%)	1 (1.3%)	8 (10.4%)	67 (87.0%)	0.000
Oxygenation methods	42 (66.7%)	16 (25.4%)	5 (7.9%)	1 (1.3%)	10 (13.0%)	65 (84.4%)	0.000
ABCDE approach	32 (50.8%)	22 (34.9%)	9 (14.3%)	0 (0%)	6 (7.8%)	71 (92.2%)	0.000
Safe defibrillation	57 (90.5%)	3 (4.3%)	3 (4.3%)	3 (3.9%)	14 (18.2%)	60 (77.9%)	0.00
SBAR communication	55 (87.3%)	4 (6.3%)	1 (1.3%)	1 (1.3%)	18 (23.4%)	57 (74%)	0.00
Ambu bag ventilation	38 (60.3%)	21 (33.3%)	4 (6.3%)	2 (2.6%)	7 (9.1%)	66 (85.7%)	0.00
Recognize cardiac rhythm	41 (65.1%)	19 (30.2%)	2 (3.2%)	1 (1.3%)	9 (11.7%)	67 (87.0%)	0.00
Recognition of spontaneous return of pulse	49 (77.8%)	9 (14.3%)	5 (7.9%)	3 (3.9%)	9 (11.7%)	65 (84.4%)	0.00
Doing jaw thrust	47 (74.6%)	12 (19.0%)	4 (6.3%)	3 (3.9%)	8 (10.4%)	66 (85.7%)	0.00
Cervical stabilization	58 (92.1%)	4 (6.3%)	1 (1.6%)	3 (3.9%)	9 (11.7%)	65 (84.4%)	0.00
Log rolling	59 (93.7%)	2 (3.2%)	1 (1.6%)	8 (10.5%)	12 (15.8%)	54 (71.1%)	0.00
Recognize and manage shock	39 (61.9%)	21 (33.3%)	2 (3.2%)	4 (5.2%)	20 (26.0%)	53 (68.8%)	0.00
Manage chest trauma	56 (88.9%)	7 (11.1%)	0 (0.0%)	3 (3.9%)	20 (26.0%)	53 (68.8%)	0.00
Managing abdominal trauma	56 (88.9%)	6 (9.5%)	1 (1.6%)	6 (7.8%)	17 (22.0%)	52 (67.5%)	0.00
Managing neuro trauma	59 (83.5%)	3 (4.8%)	1 (1.6%)	7 (9.1%)	17 (22.1%)	52 (67.5%)	0.00
Massive blood transfusion	52 (82.5%)	6 (9.5%)	3 (4.8%)	9 (11.7%)	30 (39.0%)	38 (49.4%)	0.00
Placing 12 lead ECG	51 (81.0%)	10 (15.9%)	2 (3.2%)	2 (2.6%)	9 (11.7%)	64 (83.1%)	0.00
Rhythm recognition in monitor	54 (85.7%)	7 (11.1%)	0 (0.0%)	4 (5.3%)	12 (15.8%)	59 (77.6)	0.00
Recognize AV block	59 (93.7%)	4 (6.3%)	0 (0.0%)	9 (11.7%)	21 (27.3%)	47 (61.0%)	0.00
Differentiating between SVT and VT	60 (95.2%)	3 (4.8%)	0 (0.0%)	11 (14.3%)	21 (27.3%)	43 (55.8%)	0.00
ECG findings in ACS	41 (65.1%)	17 (27.0%)	5 (7.9%)	5 (5.6%)	18 (23.4%)	53 (68.8%)	0.00

pretest were less than post-test. Tow third of the participant were female. Age ranged from 22.6-27, with the mean age of 23.4. Table 1 shows student responses to all domains. Among the 25 items surveyed, students reported statistically significant improvement in all items**.** Regarding the exam results, in ILS and PLS the pass rate were 100%. In basic trauma course 78 out of 81 (96.3%) passed the written test

DISCUSSION

In this report, boot camp training resulted in statistically significant improvement in competency of the medical students. The improvement was noted in all domains. We notice during formative assessment, excellent performance in skills repeated in more than one theme. For example, airway skills were addressed in immediate life support and trauma. Ortiz *et al* did an intensive one-day trauma boot camp to improve deficiency in interns' skills in trauma management. He demonstrated significant improvement in self-reported confidence of Crew Resource Management (CRM) concepts, role delegation, leadership, and performance of primary and secondary surveys (Ortiz Figueroa *et al*., 2016). The same effect of boot camp was also reported by Minha *et al* showing that implementing mandatory, simulation-based, pre-internship workshop made a significant perceived impact on interns and residents (Minha *et al*., 2016). At the University of Maryland they conducted 3 half days boot camp. All respondents reported increased confidence in caring for patients in all subject areas taught (Bontempo *et al*., 2016). The positive impact of boot camp in our study strengthens the previously reported benefits from other studies. Boot camp is a comprehensive experience for skills and competency learning for both young doctors and medical students. Some reports demonstrated sustainable impact (Bontempo *et al*., 2016). The drive for designing this boot camp to our trainee is to provide short term solution to published report indicating lack of clinical competencies in many skills among medical graduates in Sudan (Abdalrahman *et al*., 2017). The same report showed that the majority of medical school (81.2%) did not have structure curriculum in EM (Abdalrahman *et al*., 2017). It worth noting that Sudan has only 36 emergency medicine physician registered in the records of Sudan Medical Council. If we assume all of them are working, this will reflect a significant deficiency in EM providers in a country of more than 38,000,000 populations. Since the country lacks the appropriately qualified providers, it is expected from fresh graduate to deal with many critically ill patients and medical emergencies. It was reported that there were variability in the degrees of supervision and delegation (A-Rahman and Jacquet, 2014). Improving skills of these graduates is essential to deliver effective and safe patient care. One of the major safety guard for critically ill patient in ER is the competency of the healthcare provider. Sometimes there is limited or no chance to make a second evaluation, so mistakes by EM physician are serious (Kellerman, 1995). As a short term solution we think boot camp training may help to narrow gap related to lack of structure training and shortage in qualified EM providers. The outcome of this experience can help to expand the application of boot camp in other area, especially in low resource country.

Though this study reported significant improvement based on self-reported competency, it is important to look at it cautiously. Providers may overestimate their competency and abilities. Hocagil *et al* reported that among 83.8% of the providers who rank their knowledge and skills as sufficient, only 16.2% really had sufficient knowledge (Hocagil *et al*., 2014). Long term, measurement and impact need to be addressed in the future. This short term training was able to deliver individual and team based skills. It does not guarantee contextual application. Desgning boot camp is a challenging process. It requires looking at the current situation and maping the future. Lamba *et al* designed boot camp for medical graduates coming to EM residency. They set the milestone documet as a future bench mark and ultized the core entrustable professional activities to emegrency medicineas base line (Lambda *et al*., 2016). This helped them to identify the gaps. in our boot camp we assessed the gap and we addressed the context of care delivery. For exmple our interns are not supposed to place achest tube, but they are requirred to recignize when it is indicated, how to monitor the output, when to call for help. This helped us to focus on the really needed activities. Future camps can address high level and complex askills.

Conclusion

Boot camp training significantly improved the skills of the final years medical students as measured by self-reported competency. Designing boot camp is a challenging process and requirres measurring baseline status and future benchmarks.

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