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ORIGINAL ARTICLE

INTRODUCTION OF SIMULATION BASED MEDICAL EDUCATION AT ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES: EXPERIENCE AND CHALLENGE.

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ABSTRACT

Background: As one of the countries in Sub-Saharan Africa with a low physician to population ratio, Ethiopia has sought to mitigate the problem by increasing the number of students enrolling in the existing medical schools. This increase in enrolment was not accompanied by expansion of clinical training venues, which has resulted in less patient contact time for each student. As part of the solution to fill the gap simulation-based teaching was introduced.

Objective: To describe the process of introducing Simulation based medical education (SBME) at Addis Ababa University College of Health Sciences, school of medicine.

Methods: Two rounds of intensive training was given by John Hopkins in collaboration with Medical Education partner Initiative (MEPI) to the core clinical educators to introduce them the six-step model of curriculum development for medical education and standardized patient (SP) techniques with the ultimate aim of introducing SPs in the teaching and learning process for medical students. The training included didactic and workshop elements, with group work and created complete educational modules. Each pre and post course assessment of experience and attitude were surveyed. Data was analyzed in aggregate using paired t -test to compare pre and post course means.

Results: There were total of 22 faculty members participated in the first group ,the majority of whom had no prior training in curriculum development or SBME and were skeptical of the value of SBME, as evidenced in their survey responses.(3.42/5 in Likert scale 1= least 5= most) at the end of the course the participant were comfortable with the concept of curriculum development the rating increased to 4.45/5(P< 0.0001) and they embraced more favorable attitudes regarding the feasibility and desirability of simulation with Likert Scale 4.01/5 to 4.51 (P<0.0001). In the second course, there were 16 participant and the majority had no prior experience with simulation and/or SP encounters. Their Baseline attitudes among participants in the second course were more favourable than in the first course, with a mean precourse Likert score of 4.24/5. Mean post course score was 4.43/5 (p=0.1003), which did not represent a significant increase. The largest pre/post increases were seen for questions regarding accuracy of SP portrayal of specific clinical conditions (3.93 to 4.43, p=0.0011), and enjoyability of incorporating SP activities into curricula (4.33 to 4.73, p=0.0281).After the course, the faculty remained particularly sceptical of the role of SPs in grading students (3.43/5).

Both courses were well received, with 95% reporting they learned what they had hoped to learn.

Conclusion: Training courses at CHS were successful for generating enthusiasm about simulation, and improving participant attitudes regarding the usefulness and feasibility of this educational method.

Keywords: Simulation: medical education: standardized patients

INTRODUCTION

In 2006, the World Health Organization (WHO) alerted the world about the critical shortage of trained health professionals. Globally there is a deficit of approximately 2.4 million doctors, nurses, and midwives, and proportional shortages are greatest in

Sub-Saharan Africa (1). The Global Health Workforce Alliance was created in 2006 as a common platform for action to tackle this problem. The Alliance set up a task force to address expansion of education and training for health workers. In 2008 the task force produced the report "*Scaling Up, Saving Lives,*" which contained ten point recommendations for joint action by the stakeholders (2).

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As one of the countries in Sub-Saharan Africa with a low physician to population ratio(3). Ethiopia has sought to mitigate the problem by opening new medical schools across the country and increasing the number of students enrolled in the existing medical schools. At Addis Ababa University School of Medicine (AAUSOM), the number of medical students increased dramatically from 150 students in 2009 to over 300 in 2015 (Personal communication undergraduate). This increase in enrolment was not accompanied by expansion of clinical training venues, which has resulted in less patient contact time for each student, as well as increases in patient fatigue, thereby potentially compromising the quality of education.

In 2013, the WHO developed guidelines to aid institutions in achieving the goal of producing graduates responsive to the health needs of the populations they serve. The guidelines contain twelve recommendations, including use of simulation in the training of health professionals (4). AAU has embraced simulation-based medical education (SBME) as part of the solution to fill the gap

Simulation in medical education is an educational modality that replicates or imitates a real clinical environment. It provides health care professionals the opportunity to acquire and master key skills and behaviors in a risk-free environment. Simulation based medical education is widely used in the developed world as the result of demand for patient safety, rapid development of new medical technology and management modalities, need for training in specific presentations and diagnoses to fulfill educational objectives, and insufficient clinical training opportunities with actual patients (5-8).

The initiative at AAU started with allocating space for a new simulation centre, training of core faculty in simulation-based teaching and assessment methods, and acquisition of a wide range of simulation equipment. Incorporating simulation based teaching activities designed to improve the skills, attitudes, and knowledge of the graduates is also underway. This article will discuss the steps taken to introduce SBME in the curriculum at AAU, College of Health Sciences (CHS).

MATERIALS AND METHODS

Faculty from the Johns Hopkins University School of Medicine (JHUSOM) in the United States collaborated with the Medical Education Partnership Initia-

tive (MEPI) in order to introduce SBME in the School of Medicine. Visiting faculty from JHUSOM travelled to Ethiopia to deliver two intensive training courses for core faculty educators at AAUSOM. Both courses were structured as highly participatory workshops, with attendees working together in groups to create and demonstrate complete educational modules. Both courses were designed as train-the trainer programs, wherein participants were expected to not only use the skills they learned in their own work as educators, but subsequently to pass these skills on to their colleagues.

The first course took place in August 2012, and covered all forms of simulation-based teaching and assessment methodology, including task trainers, human patient simulators, and standardized patients. The major goal of this training was to introduce the faculty to simulation using the six-step (Kern) model of curriculum development for medical education (9). This course included an overview of curriculum development methodology, as well as modules on needs assessment, goals and objectives, educational strategies, implementation issues, learner assessment, and program evaluation. It also included sessions on topics specific to simulation, including scenario design and debriefing techniques. The curriculum of this course is described in more detail in Table 1.

The second course took place in February 2015, and focused specifically on standardized patient (SP) techniques. An SP is an individual who is trained to portray the historical, physical, and emotional features of an actual patient accurately and in a consistent manner. SPs can be used for both learning clinical and communication skills, and for standardized assessment of learners (6). The ultimate aim of the second training was to enable faculty to introduce SPs in the teaching and learning process for medical students. This course included an overview of standardized patient methodology, as well as modules on curricular integration, goals and objectives, basic and advanced case development, checklist creation, assessment and ratter training, and effective debriefing. The curriculum of this course is described in more detail in Table 2.

Of note, in addition to faculty participants, this course included several actors from the AAU Theatrical art Department. The actors participated as observers in the course, and served as SPs for workshop activities and final curricular demonstrations.

Participant attitudes regarding SBME were surveyed before and after each course. Survey data was identified and analysed in aggregate using paired t-test to compare pre/post means. Participants were also surveyed regarding their personal experience and inter-

est in simulation before each course, and course evaluation data was collected after each course.

Table 1: Components of Initial Train-the-Trainer Course

Course Component	Description
Overview of Curriculum Development	Didactic on the Six-Step (Kern) Model of curriculum development that is widely accepted as a “best practice” in medical education
Problem Identification and General Needs Assessment	Review of needs assessment conducted by MEPI staff prior to the course, addressing general concerns in providing adequate clinical education for large class size
Targeted Needs Assessment	Group discussion of specific needs for the clinical education of AAUSOM students, with prioritization and selection of problems to be addressed
Goals and Objectives	Didactic and workshop on development of quality goals and objectives using the “SMART” framework
Educational Strategies	Didactic and workshop on development of scenarios and cases for both manikins and standardized patient
Implementation of New Curricula	Group discussion and workshop on potential barriers to implementation of simulation-based curricular initiatives, and brainstorming of possible solutions
Introduction to Debriefing	Didactic on accepted best practices in debriefing, followed by practicum in which faculty debriefed a challenging “learner” from videotaped simulation scenarios
Evaluation and Assessment	Didactic and workshop on rigorous methods for conducting programmatic evaluation and assessment of individual learners, including discussion of reliability and validity concepts
Final Presentations	Presentation of curricular modules by small groups, including demonstration of the actual simulation and debriefing, with course faculty as “learners.” Participants and faculty provided feedback.

Table 2: Components of Second Train-the-Trainer Course

Course Component	Description
Introduction to Standardized Patient (SP) Methods	Didactic on the history of SP education, the rationale and theoretical foundations of this teaching method, and scientific evidence supporting its use
Integration of SPs into Medical Education Curricula	Presentation of “normal” and “creative” uses of SPs in curricula, followed by discussion of educational needs that could be filled by SP-based teaching sessions
Goals and Objectives	Didactic and workshop on development of quality goals and objectives using the “SMART” framework
Basic SP Case Development	Didactic and workshop on techniques for constructing a complete and effective SP case for use in medical education
Advanced SP Case Development	Didactic and workshop on techniques for enhancing realism and complexity in SP cases, including character development, costuming and moulage, abnormal exam findings, strong emotions, and use of behavioral shaping for learners
Checklist Creation	Didactic and workshop on development of psychometrically sound checklists for use in SP encounters including history, physical exam, and interpersonal skill elements
SP-Based Assessment and Rater Training	Didactic on reliability and validity concepts, followed by a rater training and calibration exercise wherein participants used “real” SP checklists to grade learner performance and assessed their reliability
Effective Debriefing	Didactic and workshop on “best practices” in debriefing, followed by practicum wherein participants practiced debriefing the “learner” from videotaped SP encounters.
Final Presentations	Presentation of SP cases by small groups, including demonstration of the actual case and debriefing, with other participants as “learners.” Participants and faculty provided feedback.

RESULTS

During the initial training, 22 faculty members participated and 100% completed pre- and post-course surveys. Regarding their current educational duties, 52% reported responsibility for teaching clinical skills, and 30% reported responsibility for teaching procedural skills. While only 26% indicated that they had any prior training in simulation, 57% reported current use of simulation in their work as educators. Prior to the course, faculty in the initial training rated their overall comfort with curriculum development concepts at 3.42/5 on the Likert scale.

After the course, this rating increased to 4.45/5 ($p < 0.0001$). Responses to specific survey questions on participant comfort are summarized in Table 3. Following the course, participants also adopted more favourable attitudes regarding simulation, with a precourse mean of 4.01/5 for Likert items relating to the value and feasibility of simulation, and a post course mean of 4.51/5 ($p < 0.0001$). Responses to specific survey questions on simulation attitudes are summarized in Table 4. Course evaluations were very positive, with 95% of participants reporting that they had learned what they wanted to learn, and 100% reporting that the course met its objectives.

Table 3: Initial Training - Participant Comfort with Educational Concepts

Rate level of comfort with each: (Likert 1-5; 1=least, 5=most)	PRE Rating	POST Rating	P-value
Curriculum development in general	3.39	4.41	0.0003
Development of simulation-based curricula in particular	3.35	4.50	<0.0001
Conducting a needs assessment	3.61	4.41	0.0037
Writing goals and objectives	3.70	4.73	<0.0001
Selecting educational strategies	3.30	4.55	<0.0001
Implementing curricula in general	3.45	4.33	0.0038
Implementing simulation-based curricula in particular	3.48	4.50	0.0005
Evaluating success of curricula	3.55	4.36	0.0036
Assessing attainment of objectives by individual learners	3.50	4.45	0.0021
Mentoring other educators in curriculum development	3.13	4.32	<0.0001
Mentoring other educators in simulation	3.13	4.36	<0.0001

Table 4: Initial Training – Participant Attitudes Regarding Simulation

Rate level of agreement with each: (Likert 1-5; 1=least, 5=most)	PRE Rating	POST Rating	P-value
My learners will enjoy simulation	4.39	4.80	0.0208
Simulation is an effective assessment tool	3.96	4.57	0.0133
Simulation-based training can improve patient outcomes	4.14	4.57	0.0570
SPs can be effective educators for medical students	3.96	4.38	0.0474
Senior students can be effective educators for junior students	3.74	4.29	0.0064
Computer-based simulators can educate effectively	3.87	4.43	0.0137
Curriculum development in general	3.39	4.41	0.0003

There were 16 participants in the second training, 16 of whom completed pre-and post-course surveys, for an 88% response rate. Only 19% of participants reported any prior experience with simulation or SPs, and described their knowledge regarding simulation as “intermediate”. The remaining 81% described themselves as “novice” with respect to SPs. Participants in the “intermediate” group reported prior use of task trainers for teaching surgical skills or cardiopulmonary resuscitation. Only one participant had ever seen an SP session, and none had used SPs in their own teaching.

Baseline attitudes among participants in the second course were more favourable than in the first course, with a mean precourse Likert score of 4.24/5. Mean

post course score was 4.43/5 ($p=0.1003$), which did not represent a significant increase. The largest pre/post increases were seen for questions regarding accuracy of SP portrayal of specific clinical conditions (3.93 to 4.43, $p=0.0011$), and enjoy ability of incorporating SP activities into curricula (4.33 to 4.73, $p=0.0281$). After the course, the faculty remained particularly sceptical of the role of SPs in grading students (3.43/5). Responses to specific attitudinal questions are summarized in Table 5. Like the prior course, this course was well received, with 94% reporting they learned what they had hoped to learn, and 100% expressing interest in similar future courses.

Table 5: Second Training – Participant Attitudes Regarding Standardized Patients

Rate level of agreement with each: (Likert 1-5; 1=least, 5=most)	PRE Rating	POST Rating	P-value
SP encounters will enhance my students learning	4.63	4.88	0.2500
<i>Faculty</i> watching SP encounters could accurately assess students' clinical performance	4.50	4.81	0.3125
<i>SPs themselves</i> could provide useful feedback for my students	4.31	4.25	0.5805
<i>SPs themselves</i> could accurately assess student performance	3.67	3.44	0.2292
It is feasible to integrate SPs into my educational work	4.31	4.47	0.1542
SPs can accurately portray common local patients and problems	3.93	4.43	0.0011*
I will enjoy incorporating SP activities into my educational work	4.33	4.73	0.4000

DISCUSSION

In the developing world, the introduction of SBME is relatively new. Increased demand, scaling up of training of health professionals, lack of educators, and emergence of new diseases became motivation for the adoption of SBME as an adjuvant to traditional medical education, as observed in South Africa, India and the Middle East (10-12).

Ethiopia suffers from a shortage of medical professionals, and has attempted to scale up medical education in response. Larger class sizes at AAUSOM have presented challenges in providing learners with adequate patient care experiences to ensure the rigor of their clinical training. To safeguard the quality and reliability of medical education at AAUSOM, the school introduced SBME as a modality of learning in order to augment the original medical curriculum as recommended by the task force. Several studies indicate that incorporating of SBME into curricula helps the learner master new skills and transfer them to clinical practice, and that it ultimately contributes to better patient outcomes (13-16). It also helps to standardize training and assessment, and it encourages self-learning time which is believed to save time for the faculty (17,18).

Basic requirements for introduction of SBME include designated space, equipment/tools, and knowledgeable staff to teach, supervise and evaluate(3). Based on this, the college identified space for the simulation center and provided a range of simulation tools such as airway trainers for adults and pediatrics, IV insertion, ear and eye examination, procedure

trainers such as lumbar puncture, physical examination trainer, and birthing simulators. The need for faculty development in this new teaching method was also recognized.

Experienced educators from JHUSOM provided the initial training on curriculum development and exposed the participants to all forms of simulation used in medical education. The participants were faculty members from different departments of the college, the majority of whom had no prior training in curriculum development or SBME. At the outset of the course, they were skeptical of the value of SBME, as evidenced in their survey responses as observed. During the course, the trainees developed and piloted standardized patient (SP), mannequin and hybrid (SP and mannequin) simulation-based teaching modules. At the end of the course the participants were comfortable with the concept of curriculum development and embraced more favorable attitudes regarding the feasibility and desirability of simulation.

In the second course, participants' baseline attitudes towards use of SPs for medical education were largely positive, despite the fact that the majority had no prior experience with simulation and/or SP encounters. They initially demonstrated skepticism about the ability of SPs to accurately portray clinical scenarios, but after the training they were more confident that SPs could reliably simulate the specific history, physical examination, and personality elements correctly.

Both before and after the training, participants expressed doubt in the ability of SPs to assess students accurately. As the course did not cover this aspect of SP training, this is not a surprising outcome. While the literature demonstrates that SPs can grade learners as accurately as faculty (19-21), these studies have been conducted in settings with established simulation programs using highly experienced SPs and trainers. With experience, it is reasonable to postulate that SPs will garner the knowledge and skills necessary to assume a role in assessment of learners, but it may be prudent to avoid this at the outset.

Overall the acceptance by the faculty members regarding the value and feasibility of simulation based medical education is encouraging this is reflected in the increase of medical students' attendance with their preceptors in the last two months

The establishment of the simulation center and running it in full capacity took several years to accomplish, and indeed is ongoing. This was due to administrative issues regarding renovation, procurement of simulation equipment, and harmonization of the program with the current academic schedule. Space, high ratio of students to well-trained educator, and financial issues remain the challenge to use the center in its full capacity. Training of more faculties in the effective use of SBME, developing additional simulation curricula to promote learner achievement, is the way forward.

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