

ORIGINAL RESEARCH

Near-Peer Emergency Medicine for Medical Students in Port-au-Prince, Haiti: An Example of Rethinking Global Health Interventions in Developing Countries

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Abstract

BACKGROUND During a 3-year time frame, a partnership between medical trainees in Haiti and the United States was forged with the objective of implementing an emergency response skills curriculum at a medical school in Port-au-Prince. The effort sought to assess the validity of a near-peer, bidirectional, cross-cultural teaching format as both a global health experience for medical students and as an effective component of improving medical education and emergency response infrastructure in developing countries such as Haiti.

METHOD Medical students and emergency medicine (EM) residents from a North American medical school designed and taught a module on emergency response skills in PAP and certified medical students in basic cardiac life support (BLS) over 2 consecutive years. Five-point Likert scale self-efficacy (SE) surveys and multiple-choice fund of knowledge (FOK) assessments were distributed pre- and post-module each year and analyzed with paired *t* tests and longitudinal follow-up of the first cohort. Narrative evaluations from participants were collected to gather feedback for improving the module.

FINDINGS Challenges included bridging language barriers, maintaining continuity between cohorts, and adapting to unexpected schedule changes. Overall, 115 students were certified in BLS with significant postcurriculum improvements in SE scores (2.75 ± 0.93 in 2013 and 2.82 ± 1.06 in 2014; $P < 0.001$) and FOK scores ($22\% \pm 15\%$ in 2013 and $41\% \pm 16\%$ in 2014; $P < 0.001$). Of 24 Haitian students surveyed at 1-year follow-up from the 2013 cohort, 7 (29.3%) reported using taught skills in real-life situations since completing the module. The US group was invited to repeat the project for a third year.

CONCLUSIONS Near-peer, cross-cultural academic exchange is an effective method of medical student-centered emergency training in Haiti. Limitations such as successfully implementing sustainability measures, addressing cultural differences, and coordinating between groups persist. This scalable, reproducible, and mutually beneficial collaboration between North American and Haitian medical trainees is a valid conduit for building Haiti's emergency response infrastructure and promoting global health.

KEY WORDS prehospital care, first responder, medical education, resuscitation, trauma, Haiti, global health

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INTRODUCTION

The need to improve emergency response capacity in low- and middle-income countries (LMICs) is well documented.^{1,2} In Haiti, 84% of college graduates emigrate to other nations, contributing to a shortage of physicians and weakening health care delivery infrastructure.^{3,4} Current medical students in Haiti remain an untapped and critical resource for local health care capacity improvement. Medical Students for Haiti (MS4H) is a nonprofit organization founded by Haitian-American medical students seeking to educate and engage Haitian medical students through a cross-cultural, near-peer teaching platform to improve health care capacity and health outcomes in Haiti.

Three years ago, several student members of MS4H at the Icahn School of Medicine at Mount Sinai (ISMMS), New York City, set out to respond to a request from students and faculty at Université Quisqueya (UniQ) for help restructuring their curriculum in a way that enhanced its clinical focus. The US students designed a project that was within the purview of their skills set by offering short courses that would be taught by medical students with as much faculty oversight and advice as was freely offered. Near-peer teaching is an established, effective teaching method used in several settings by Western medical schools. Examples include residents teaching medical students on the clinical wards and senior students mentoring junior students in basic science curricula.^{5–9} Some argue that the value of near-peer teaching is the inexperience of the teachers, allowing them to communicate complex concepts in ways that are readily understandable by newer learners. This platform was chosen for its potential sustainability and in an effort to implement an ethically sound global health intervention at the medical school level.¹⁰

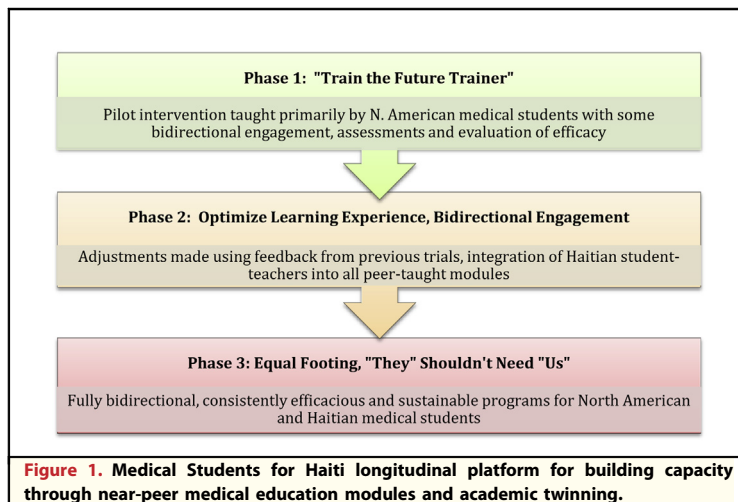
METHODS

MS4H's first intervention was a 4-week foundational anatomy course that excited students and faculty at UniQ enough that MS4H was asked to produce another course shortly afterward. In an effort to engage and empower Haitian medical students directly, students were asked if emergency medicine (EM) was a desirable subject, and then asked which emergencies they felt most likely to witness. To a list of basic emergency types, topics added included traumatic brain injury, stroke/ altered mental status, and penetrating/gun-shot

wounds. This kind of feedback and collaboration with students and faculty at UniQ ensured that the intervention was tailored to the needs of the recipient.

At ISMMS, second-year medical students who are basic cardiac life support instructor certified (BLS-IC) by the American Heart Association (AHA) teach and certify incoming first-year medical students in BLS, and recertify graduating fourth-year students continuing on to residency. MS4H expanded on this near-peer teaching concept by implementing a 1-week near-peer–led combined EM module and AHA BLS certification course at UniQ in Haiti in March 2013 and March 2014 in an attempt to equip Haitian medical students with the skills needed to better respond to emergency situations. The Regional Emergency Medical Services Council of New York City (REMSCO) is the AHA International and BLS certification office associated with ISMMS. REMSCO supplied curricular resources and quality oversight to certify as many as 85 UniQ students per year. Aspects of the BLS curriculum inapplicable to the low-resource setting in Haiti, such as the use of defibrillators in the field and calling “911” were modified or omitted. Certification comprised of a written examination provided by REMSCO as well as an observed practical skills examination by BLS-IC. Each of these is a component required by the AHA to certify a participant in BLS. The required student-to-instructor ratio of 3:1 was observed. The 1-week near-peer–led combined EM module and AHA BLS certification course is the first step in a multiphase, longitudinal platform that aims to train Haitian medical students as future peer trainers. This platform ultimately aims to build more sustainable, bidirectional programs for North American and Haitian medical students (Fig. 1).

To assess effectiveness of the educational model, before and after fund-of-knowledge (FOK) tests and self-efficacy (SE) surveys were distributed to UniQ students. The FOK exam consisted of 27 multiple-choice questions (MCQ) derived from EM course material and reviewed by EM faculty before test administration. The same FOK exam was revised by supervising faculty to a 21-item MCQ examination used in 2014. The SE survey consisted of a 26-item, 5-point Likert Scale survey with a response of 1 indicating *not comfortable at all* and 5 signifying *extremely comfortable* with the corresponding skill. Twenty-four students from the 2013 UniQ cohort were given a follow-up survey in 2014 to assess whether skills learned in the



module had been used in the field in the interim year. FOK was not reassessed in the follow-up cohort due to time constraints.

All original written materials used in Haiti were professionally translated to French using STRAKER Translations (New York, NY, USA). All study materials and protocols were exempt as per the ISMMS Institutional Review Board (IRB). The corresponding IRB-equivalent personnel at UniQ also approved the study and provided documentation of a formal invitation for all activities affiliated with the project.

UniQ Student Selection. Criteria for students to participate included no previous BLS experience, current enrollment in UniQ, and availability to complete the entire weeklong module. Any students who could not complete the full module, or who dropped out midway through, were excluded from

the analysis. Survey information was recorded using a form designed by participating ISMMS students and residents who also collected demographic information for the Haitian student cohort in 2013 (Table 1).

Emergency Medicine/First-Responder Component. ISMMS medical students developed the EM/first-responder module based on an EM introductory course taught to first-year students at ISMMS. The module combined a series of lectures on the following topics: approaching the patient, musculoskeletal injuries, central nervous system (CNS) and head trauma, and wounds and burns. Relevant practical skills sessions associated with each lecture topic were as follows:

- Approaching the patient: pulses and epistaxis, seizures;
- Wounds and burns: pressure dressings, impaled objects and penetrating eye trauma, burn treatment;
- Musculoskeletal injuries: upper extremity splinting, lower extremity splinting; and
- CNS and head trauma: CNS imaging, Glasgow Coma Scale, cervical collar, and log roll.

Each day, 2 lectures were given in the morning, followed by skills sessions in the afternoon. Each skill session consisted of 5 different stations, manned by 2 ISMMS personnel each. After 20 minutes at a station, UniQ students rotated to the next station, until they completed all stations (Fig. 2). The reasoning behind these methods was to present the knowledge through morning lectures, while solidifying important practical concepts through hands-on skills sessions in the afternoons.

Leading up to the module, lectures and skills sessions were rehearsed by the ISMMS student trainers under the supervision of EM faculty and residents. Lectures and practical skills sessions comprised 2 full days of the weeklong project. The remaining 3 days were dedicated to BLS certification.

In 2015, a 10 session pretrip curriculum for the ISMMS medical students was added to the project. The first class was devoted to the screening of a documentary film entitled "Baseball in the Time of Cholera" and a discussion of the current state of health care in Haiti. Each of the subsequent classes delved further into aspects of Haitian history and culture that could influence health outcomes, including topics such as Vodou and its impact on perceptions of Western medicine and health care delivery in Haiti. This curriculum was added in

Table 1. Student Demographics*

Student ages (y)	19-31 (average age: 22.5)
Sex (m/f %)	38/62
Hometown (%)	76 urban vs 22 rural
Average number of siblings	3.6
Average number of languages spoken	2.2
Never traveled outside Haiti (%)	63
Never exposed to BLS before (%)	78
Reported being in a situation previously where BLS or basic EM skills would have been helpful (%)	38%

BLS, basic cardiac life support; EM, emergency medicine.

* Data derived from 63 students participating in 2013 course.

Sunday (3/23)	Monday (3/24)	Tuesday	Wednesday (3/26)	Thursday (3/27)
Introductory Break Out Sessions, Pre-Test	Approaching the Patient in the Field (8:30am - 9:30am)	Holiday	Musculoskeletal Injuries and Fractures (8:30am - 9:30am)	Infectious Disease Module Taught by Université Quisqueya Students (9AM-12PM)
Video Session: American Heart Association Basic Cardiac Life Support (BCLS) Curriculum for 60-80 students *Curriculum Approved by The Regional Emergency Medical Services Council of New York	Lecture: One MSI, One MSII Small Group Leaders: Two MSII's Translators: 2 Attending Physicians		Lecture: Two MSII's SG Leaders: Two MSI's	
Lunch	Wounds and Burns (9:45am - 10:45am) Lecture: Two MSII's SG Leaders: Two MSII's Combined SG (11:00am - 12:00pm)	Holiday	C-Spine + Head Trauma (9:45am - 10:45am) Lecture: Two MSI's SG Leaders: One MSI, One MSI	
BCLS Practical Examination (small groups of ~ 10)	Practical Skills Session: Wounds and Burns Management (3 sided dressing, compression, eye burns)	Holiday	Practical Skills Session Cervical Spine and Head Trauma (C-Collar use, Log Roll, Transfer)	Post-Test Surveys and Debrief

Figure 2. One-week emergency medicine/basic cardiac life support curriculum itinerary. MS, medical student.

response to feedback from ISMMS students requesting formalized preparation and orientation to the cultural and health care landscape in Haiti before the trip. These sessions aimed to broaden student cultural perceptions and introduce the subject of international development.

Statistical Analysis. ISMMS students not involved in course implementation performed initial data entry, analysis, and pairing of pre- and postmodule FOK and SE assessments. IBM SPSS Statistics Version 22 was used for all statistical analysis in this study. Unpaired data was excluded from analysis. FOK and SE scores were summed separately and means calculated for pre- and postmodule assessments. SDs and SEMs were calculated for pre- and post-FOK and SE scores. Pre- and post-module FOK and SE scores were compared with a paired Student's *t* test for repeated measures. A 2-sample, unequal variance, Student's *t* test was used to calculate statistical significance between the 2013 and 2014 learner cohorts for pre- and postmodule FOK percent score means, pre- and SE scores between years (Table 2). A *P* value cutoff of <0.05 was used to indicate statistical significance between data sets.

Equipment and Fundraising. The AHA BLS module required a French AHA BLS instruction video,

French BLS manuals for all learners, and adequate adult and infant cardiopulmonary resuscitation mannequins for a 3:1 ratio of learners to mannequins. Funds for trip expenses including didactic materials, training fees, and medical evacuation insurance were sponsored by donations from Doctor's Hospital at Renaissance in Edinburg Texas, ISMMS, as well as several private donors. Participating student-instructors, residents, and attending

	2013 Cohort (N = 17)	2014 Cohort (N = 20)	<i>P</i> value*
FOK Scores			
Premodule % correct	32 ± 13	40 ± 17	0.155
Postmodule % correct	55 ± 15	81 ± 12	< 0.001
Average % change	22 ± 15	41 ± 16	< 0.001
SE Scores			
Premodule Likert score	1.50 ± 0.91	1.64 ± 0.89	0.609
Postmodule Likert score	4.25 ± 0.82	4.46 ± 0.65	0.357
Average change in score	2.75 ± 0.93	2.82 ± 1.06	0.832

FOK, fund of knowledge; SE, self-efficacy.
 Values represented as means ± 1 SD.
 * Bold values indicate statistical significance using 2-sample unequal variance *t* test (*P* < 0.001).

Table 3. Selected Student Testimony Quotes Indicating Instances Using Skills Learned in 2013 EM/BLS Module

Student ID	Quotes from Survey Endorsing Module Skill Usage	Corresponding Relevant Module
A1	"The BLS course helped me open the airway of a person in my family."	BLS
A2	"This course has greatly helped me in the case of a fractured arm. It was a small boy who was playing football and who fell."	Musculoskeletal injuries
A3	"This course was very useful and helped me last month in the city of Ville de Arovince (sp) in Haiti in 2 cases of motorcycle accidents."	Approach to the ill/injured patient
A4	"This course from last summer was very useful. It enabled me to save the life of a young woman in my neighborhood where I live."	Approach to the ill/injured patient
A5	"On multiple occasions with my team of drivers we've been able to help people who had difficulties. And at the carnival last March, we were able to resuscitate somebody who was unconscious in a couple of minutes."	Approach to the ill/injured patient
A6	"Two times I had the opportunity to do CPR in my neighborhood"	BLS
A7	"It was helpful for me because my niece swallowed a coin and I had to do the Heimlich to make her expel it. I also worked during the carnival as first aid personnel."	BLS

BLS, cardiac basic life support; CPR, cardiopulmonary resuscitation; EM, emergency medicine.

physicians paid for their own travel, immunization, and lodging expenses.

RESULTS

In all, 115 UniQ students were successfully certified in AHA BCLS over 2 years; 85 in 2013, but only 30 students in 2014 due to organizational difficulties encountered regarding teaching space, time, and resource availability. Due to similar scheduling conflicts and logistical challenges in 2013, 68 students who were part of the 2013 cohort did not attend all sessions of the EM teaching sessions, leaving 17 paired FOK examinations for analysis (20% of cohort). In 2014, 20 paired FOK examinations from an initial 30 students in the group were available for analysis (67.7%). The 2013 and 2014 cohorts had similar baseline premodule FOK and SE scores. Statistically significant improvements from pre- to postmodule FOK scores were noted in both years ($P < 0.05$). The 2014 cohort showed a significantly greater improvement from pre- to postmodule FOK scores relative to the 2013 cohort (Table 2; 22% vs. 41% increase, $P < 0.05$).

Twenty-five paired SE scores in 2013 and 20 paired scores in 2014 demonstrated that UniQ students also rated their comfort with basic emergency response skills as significantly higher after the course in both years ($P < 0.05$).

Of the 24 UniQ students from the 2013 cohort who completed the 1-year follow-up survey, 7 (29%) reported using skills learned in the course in real-life situations since completion of the module (Table 3). This was comparable to the

percentage of learners in 2013 who reported having had experiences in which BCLs or first-responder skills would have been useful before participating in the program (Table 1).

The ISMMS group was invited to offer the program for a third consecutive year.

DISCUSSION

Comparison of Trends Between 2013 and 2014. Both 2013 and 2014 showed statistically significant improvements from pre- to postmodule assessments, suggesting that the program was effective in achieving its objectives. The increased improvement in FOK scores from 2013 to 2014 may reflect an improvement in teaching methods from near-peer instructors as well as decreased absenteeism in 2014. However, factors such as changing student demographics, differing curriculum, changes to the FOK questionnaire, and other uncontrolled factors likely influenced results between cohorts. This trend was not noted for self-efficacy surveys, and both cohorts had similar improvements in self-rated comfort with select skills across years. Self-efficacy scores should be interpreted as a reflection of a student's confidence with material and attitude toward their own competency, and not necessarily as a reflection of true competency.¹¹

Practical Application and EM Capacity Building. UniQ students reported using EM and BLS skills taught in the module with a high frequency. This can be attributed to coincidence, the lack of available in-country emergency response systems, and the anecdotally reported tendency of community

members to seek out UniQ students as the nearest available source of health care. Students in LMICs may be more likely to use emergency response skills in real life than their North American counterparts,¹ highlighting the importance of high-quality, adequately supervised instruction in this domain.

Student Feedback and Limitations. Despite its importance in the initial plan for implementation of this project, ISMMS students were unable to adequately maintain contact and achieve optimum collaboration with their Haitian counterparts during the design of the curriculum. Fluency in French was encouraged but not required of American participants, which led to communication barriers throughout the process. Increased collaboration between cohorts may have reconciled disparate expectations for the clinical emphasis of the modules. As an example, computed tomography imaging was included in preliminary teaching despite the absence of computed tomography capacity in the UniQ students' known health care practice settings. This demonstrates a missed opportunity not only for the UniQ students to receive clinical training more appropriate to their health care setting, but also for US medical students to learn about availability of clinical resources in a developing country.

Although interpreters were used and all materials were translated to French, the desired instructor-to-student ratio was difficult to maintain during the 2013 EM module due to high enrollment in the module from UniQ students. To enforce the 3:1 mandated ratio for the BLS certification, many students who were not originally confirmed to take the course were turned away. This also reflected difficulties communicating expectations between collaborating institutions.

Learner absenteeism was a significant challenge in 2013, but was partially eliminated as a confounding factor in data analysis by excluding all unpaired data. Absenteeism was addressed in 2014 by adhering to a strict student roster compiled by collaborators at UniQ before the trip. Implementation of the module was further challenged in both years by inconsistent daily start times, unexpected changes in teaching facilities, and limited access to electricity for computer-based slideshow presentations. This was compounded by the short duration of the project, which limited the ability to accommodate unexpected changes. Despite the frustrating nature of these barriers, the value of firsthand navigation of these experiences for student physicians should not be overlooked. For future physicians aspiring to work competently in the field of global health, these

early exposures to frequently encountered challenges of cross-cultural communication and understanding were invaluable.

The inclusion of a control group would have strengthened our ability to demonstrate the efficacy of the teaching intervention. Direct comparison of FOK and SE scores between participants in the educational module and a cohort of UniQ students not participating in the module would allow stronger conclusions to be drawn regarding the effect of the curriculum. Additionally, the FOK exam, which represented the bulk of objective assessment for UniQ students, is not a previously validated measure of EM knowledge.

The bidirectional teaching component of the project was incorporated to promote resource sharing, capacity building, and sustainability. In 2013, senior UniQ students delivered lectures to ISMMS participants, including an overview of malaria treatment challenges in Haiti and a session on the pathophysiology of cholera. In 2014, a tour of a local clinical facility given by UniQ students provided a similar opportunity for bidirectional teaching. This study would have benefited from the use of previously validated competency assessment tools to evaluate the effect of participation on ISMMS students who completed the trip.^{12,13}

Medical students at UniQ differ substantially from US medical students with regard to their pre-enrollment educational preparation as they operate in a 6-year medical education framework beginning immediately after graduation from the equivalent of high school. This difference in educational backgrounds may have influenced near-peer relationships between Haitian medical students and US medical students and the accessibility of the curricular content. As reported by UniQ students in their feedback, ISMMS student assumptions regarding UniQ students' baseline scientific knowledge occasionally resulted in emphasis on more complex topics and less focus on basic concepts during teaching. The effects of this on the near-peer educational experience provided impetus for the inclusion of cultural and pedagogic topics in the preparatory curriculum for ISMMS students.

CONCLUSIONS

Although similar programs exist,¹¹ the utilization of near-peer teaching among medical students and residents in a global health context has not been previously reported in Haiti. These results suggest that a near-peer, cross-cultural medical education module

can be successfully implemented as a global health opportunity for medical students and EM residents.

There is a burgeoning interest in global health among EM residents.¹⁴ This project enables EM residents to function as educators, facilitators of international partnerships, and emergency response capacity builders. EM residents are well positioned to lead this type of initiative, given the track record of the specialty in global health and disaster response situations, and the need for increased EM capacity in LMICs.¹

The advantages of carrying out similar near-peer, EM-oriented global health projects at other institutions have been described previously.¹³ By focusing on medical education, teaching ability, and cultural competency as outcomes for participants, the concern regarding students delivering care beyond their clinical skill level is addressed. This educational approach also minimizes the likelihood that a foreign intervention will be perceived by locals as “practicing on the poor.”¹⁵ Additionally, this type of intervention aims to empower local health care practitioners in Haiti who will ultimately provide sustainable care to their own people, and thus acts to counteract “brain drain.”¹⁶

Initial results of this project are promising. Future iterations of the program will emphasize

increased collaboration between Haitian and US counterparts in curriculum design, implementation of Haitian medical students as instructors, and more rigorous evaluation through inclusion of a control group and ongoing longitudinal follow-up of past participants. Additionally, plans to assess the effect of the program on US participants’ global health competencies using the Kirkpatrick model are underway.¹⁴ Sustainability of this partnership will be a crucial aspect of its success, and as of the writing of this paper, plans are underway to undertake the program at UniQ for a third year.

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