Annals of Global Health
VOL. 83, NO. 2, 2017

ISSN 2214-9996/$36.00
http://dx.doi.org/10.1016/j.aogh.2017.04.003

ORIGINAL RESEARCH

Global Health Values of a Multidirectional Near Peer Training Program in Surgery, Pathology, Anatomy, Research Methodology, and Medical Education for Haitian, Rwandan, and Canadian Medical Students

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Abstract

BACKGROUND As health care delivery increasingly requires providers to cross international borders, medical students at McGill University, Canada, developed a multidirectional exchange program with Haiti and Rwanda. The program integrates surgery, pathology, anatomy, research methodology, and medical education.

OBJECTIVE The aim of the present study was to explore the global health value of this international training program to improve medical education within the environment of developing countries, such as Haiti and Rwanda, while improving sociocultural learning of Canadian students.

METHODS Students from the University of Kigali, Rwanda and Université Quisqueya, Haiti, participated in a 3-week program at McGill University. The students spanned from the first to sixth year of their respective medical training. The program consisted of anatomy dissections, surgical simulations, clinical pathology shadowing, and interactive sessions in research methodology and medical education. To evaluate the program, a survey was administered to students using a mixed methodology approach.

FINDINGS Common benefits pointed out by the participants included personal and professional growth. The exchange improved career development, sense of responsibility toward one's own community, teaching skills, and sociocultural awareness. The participants all agreed that the anatomy dissections improved their knowledge of anatomy and would make them more comfortable teaching the material when the returned to their university. The clinical simulation activities and shadowing experiences allowed them to integrate the different disciplines. However, the students all felt the research component had too little time devoted to it and that the knowledge presented was beyond their educational level.

CONCLUSION The development of an integrated international program in surgery, pathology, anatomy, research methodology, and medical education provided medical students with an opportunity to learn about differences in health care and medical education between the 3 countries. This exchange demonstrated that a crosscultural near-peer teaching environment can be an effective and sustainable method of medical student-centered development in global health.

KEY WORDS anatomy, surgery, medical education, pathology, research methodology

The authors declare that they have no conflict of interest to disclose.
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INTRODUCTION

Global health educational programs aim to promote culturally competent care while enabling personal, cultural, and social development.[1-3] These programs promote reverse education and cross-cultural exposure to different lifestyles, languages, and health care systems, which further enhances students' educational experiences, communication skills, and doctor–patient relationships.[4] Additionally, they often respond to the needs of low- and middle-income countries to improve their health care infrastructure, as previously described in Rwanda where increasing access to surgical care is a priority.[5,6]

Medical Students 4 Haiti (MS4H) is a nonprofit organization with a mission to educate and engage Haitian and North American students through a cross-cultural, near-peer teaching platform in order to improve global health capacity. The McGill chapter was established in 2012 as a means of providing students in Haiti with anatomy teaching, in response to the earthquake in that country, which destroyed the anatomy cadaver building at the Université Quisqueya Medical School. The program has since expanded, embarking on its fifth iteration, providing a more comprehensive educational curriculum for students, and accompanied by a more diverse environment by including students from Rwanda, France, and Canada.

A near-peer teaching approach was used for this program as it has proved to be successful in international exchange programs.[7] Near-peer teaching encourages the development of knowledge through the collaborative support of peers who share a common interest, such as being enrolled in similar courses or programs but at different stages of their learning.[8] This method has been demonstrated to improve teamwork skills, motivation and confidence in learning, and to generate critical thinking skills.[9]

Investigating the competency and effect of international exchange programs is essential when measuring the true value of their role in medical education.[10] To establish the utility of this international exchange program, we wanted to assess the validity and effectiveness of the training program in developing knowledge and skills in medicine, and also explore the social and developmental values of an international near-peer teaching program.[10] Through a mixed quantitative and qualitative approach, we aimed to investigate the extent of sociocultural learning that was previously reported by McAllister et al[11] and Vasquez[12] in the context of a trilateral international training program covering surgery, pathology, anatomy, research methodology, and medical education.

METHODS

International Training Program. The program consisted of 5 key components:

1. Anatomy dissection: Haitian and Rwandan students had access to a cadaver lab and worked with Canadian medical students in structured dissections of a human cadaver (24 hours)
2. Research methodology: Haitian and Rwandan students participated in a small group-learning session that aimed to teach them about the research methodology and different types of research studies and to encourage them to develop their own research projects within their home country (9 hours).
3. Clinical simulation activities: Students had clinical sessions at the Steinberg Center for Simulation and Interactive learning focused on providing basic clinical and surgical skills including suturing and knot tying, orthopedic casting and splinting, and Foley catheter and nasogastric tube insertion (33 hours).
4. Clinical shadowing: Students participated in several half-day clinical sessions with pathologists and trauma surgeons at McGill University Health Center (30 hours).
5. Structured teaching sessions: Students were taught basic teaching methodology to ensure the effective transfer of knowledge back to their communities and were asked to present a lecture and lab demonstration that was assessed; the students received (3 hours).

This expansion in 2015 from the original program in 2012 aimed to equip Haitian, Rwandan, and Canadian students to become the future peer trainers, which is an attempt to build a sustainable program. The format used was similar to what Burns[13] suggested to give the teachers a resource kit to facilitate the transference of the training into educational opportunities for their students.

Each day, a 3-hour session in the anatomy laboratory with a Canadian near-peer instructor or a 3-hour clinical shadowing experience were followed by either a clinical simulation session or "Teach the Future Teacher" sessions (Fig. 1). The program focused on anatomy dissection, as this was the original structure of the program following the 2012 earthquake in Haiti. Additional components of the program were chosen based on feedback received from participants in previous iterations.

Quantitative Survey. A quantitative survey was created using Google Survey, which collected basic

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	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
AM	Lab 1: Abdominal Wall Dissection	Lab 2: Genitourinary system	Lab 3: Solid Organ Dissection	Pathology or Trauma Surgery Shadowing at MUHC Hospital	Pathology or Trauma Surgery Shadowing at MUHC Hospital
Names:	Medical students	Urology resident	Medical students	MUHC physician	MUHC physician
PM	1 SIM Center (scrubbing and sterile technique for the OR, NG tubes)	2 SIM Center (Catheterization, bladder irrigation)	Research Methodology: Proposing a Research Question	Lab 4: Thoracic anatomy	Teaching: Introduction to Teaching Skills
Names:	Medical student	Urology resident	Surgical resident	Thoracic resident	Anesthesia resident

Figure 1. One-week international program in surgery, pathology, anatomy, research methodology, and medical education. MUHC, McGill University Health Center; NG, nasogastric; OR, operating room; SIM, simulated.

demographic information from the participants and evaluated the various individual components of the program including anatomy dissection, research methodology, clinical simulation activities, clinical shadowing in surgery and pathology, and the structured teaching sessions. The 42 questions asessing the content of the program as well as the participants' perceptions of the value and effect of the program were evaluated based on a 5-point Likert scale. Survey questions were chosen to assess the quality of the program, transferability to clinical medicine, and whether the program improved the participant's knowledge in the 5 areas. There were no validated instruments used as part of the survey. Descriptive statistics, such as means and SEMs, were used to describe the individual groups on each of the measured variables. The quantitative survey can be found in the appendix.

Qualitative Survey. From 2012 to 2015, 24 students particpated in the program. Seven students were interviewed from July 20 to September 1, 2015 as a qualitative analysis of the program. Each interview took 30 to 45 minutes to complete, and all were completed over Skype. The interviews consisted of 5 questions focused on exploring components of the program related to diversity and 6 questions focused on exploring components related to the exchange. Questions were selected based on their ability to gather information about the program's affect on their personal development, professional development, experience with diversity, and knowledge exchange. Language consideration was accounted for by translating questions into French to aid in understanding. At the beginning of each interview, one of the investigators informed the students of the anonymity of the data and the aim of the study. The interview was recorded and transcribed accordingly. Inductive analysis methodology were used to analyze the open-ended questions. Thematic content analysis of the audio recordings obtained from the debriefing was performed by 2 of the authors. The first author placed indiviudal responses to questions into thematic groups based on conceptual similarity and a second author independently analyzed the groupings. This approach was used to produce a detailed and systematic identification of the themes and patterns about the students' experiences of the learning activity.[14] Any disagreements were resolved by discussion to obtain consensus. Quotes from the

debriefing were grouped into subcategories and were subsequently collapsed into 3 major themes: personal development, diversity, and knowledge exchange.

Ethical Considerations. Informed consent was obtained from all participating students. Participation in this pilot project was voluntary. Considering the nature of the research with questionnaires and interviews, this study was performed under an exemption granted by the ethical review board.

RESULTS

Demographic Information. Table 1 demonstrates the basic demographic information of the participants. Seven students who participated in the international exchange program responded to the survey (29.16%). The student distributions were: Haiti (n = 2, 29%), Canada (n = 2, 29%), and Rwanda (n = 3, 43%). Five of the 7 students were male, and the median age of the students participating in the exchange was 23 (STD 1.4 years, SEM 0.5 years). The students spanned from first to sixth year of their respective medical school training, as medical students in Rwanda and Haiti differ from their Canadian counterparts with regard to the duration and structure of their medical curriculum.

Table 1. Demographics of Participants

Student ages, years	20-24 (average age: 23)
Sex (M/F %)	5/2 (71/29)
Country of origin, n	
Canada	2
Haiti	2
Rwanda	3
Year of medical school	
1 (%)	1 (17)
2	1 (17)
3	1 (17)
4	0
5	2 (34)
6	1 (17)

Quantitative Evaluation of the Program. All of the students participating in the survey agreed that the anatomy dissection component improved their knowledge of anatomy (Table 2; mean 4.3 ± 1.1) and made them more comfortable teaching the material to individuals in their community (Table 2; mean 4.4 ± 0.24). Furthermore, the students all agreed that the clinical simulation activities (Table 2; mean 4.6 ± 0.24) and clinical shadowing experiences (Table 2; mean 4.31 ± 0.16 and 5 ± 0) allowed them to integrate their knowledge in surgery, pathology, anatomy, and clinical medicine. Table 2 shows that the participants all reported a benefit from the teaching sessions (mean 4.7 ± 0.20). However, all of the students said the program did not allow for enough time for the research component (Table 2; mean 4.3 ± 0.16), with the students from Haiti and Rwanda claiming that the knowledge presented was beyond their educational level. The Crohnbach α score for the quantitative series was 0.7.

Qualitative Evaluation of the Program. After data analysis of the participants' responses to the open-ended questions, major themes were identified that reflected the program's benefits to personal and professional development as well as knowledge exchange and understanding of diversity (Table 3). From their participation in the program, 6 of 7 respondents (86%) outlined that the program helped them in their personal growth and to gain a greater self-awareness of their own skills. All of the respondents indicated that the program helped them acquire knowledge and develop skills that improved their confidence as professionals. In addition to improving career development and increasing the participants' motivation to pursue medical specialties (5 of 7, 71%), all of the participants said the outcomes of the exchange included a stronger sense of responsibility toward one's own community. One student from Haiti emphasized this by stating, "It [exchange program] motivated me because now I know I need to work harder to try to be a good doctor to help my country to be one day like Canada in health care."

The diversity of the exchange provided them with an opportunity to learn about differences in health care and all medical school education between the three countries represented in the program (71% and 100%, respectively). One student from Rwanda illustrated this by highighting that during the exchange, "I had the opportunity to learn how other students from other parts of the world learn, what we have in common, and what they have better than us." By contrasting the strengths and weaknesses of each system, 86% of the participants said they gained a greater appreciation and sensitivity to sociocultural awareness as well as a broader view of medical sciences in a global context.

Eighty-six percent of the participants said the major themes were the benefits of near-peer teaching and the development of teaching skills, which help ensure the sustainability of the program upon return to their countries of origin.

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Table 2. Quantitative Analysis of the Program

Statement*	Mean Likert Score
Participation in anatomy dissection improved my knowledge of anatomy.	4.3 ± 1.1
I feel comfortable teaching the material learned in anatomy to other students.	4.4 ± 0.24
The clinical skills sessions allowed me to integrate knowledge in anatomy, pathology, and clinical medicine.	4.6 ± 0.24
The research component was well taught and presented.	3.9 ± 0.69
Participation in the surgical shadowing program allowed me to link my knowledge of surgery to clinical medicine and anatomy.	4.3 ± .16
Participation in the shadowing program helped me further my understanding of pathological concepts.	5 ± 0
The teaching component allowed me to learn important skills to help me teach anatomy to other students.	4.7 ± 0.20

* Responses were reported on a 5-point Likert scale: 1 = *strongly disagree*; 3 = *neither agree nor disagree*; 5 = *strongly agree*.

DISCUSSION

As health care delivery requires providers to cross international borders and collaborate with other countries, there is a growing need for international training approaches for future health practitioners. The development of this integrated program in surgery, pathology, anatomy, research methodology, and medical education provided students with an opportunity to improve their knowledge in these medical fields in a diverse near-peer teaching environment. Haitian, Rwandan, and Canadian students particpating within the exchange program reported its effectiveness in improving their knowledge of surgery, pathology, anatomy, and clinical medicine while instilling comfort in teaching the material to their respective communities.

Results from the present study are supported by those of Pean et al, who explored the value of a near-peer, bidirectional, cross-cultural teaching format in emergency medicine for medical students in Haiti.[15] Medical students and emergency medicine residents from Mount Sinai Medical School in New York City designed and taught a module on emergency response skills in Port au Prince and certified medical students in basic cardiac life support over 2 consecutive years. The study found the academic exchange to be an effective method of medical student–centered emergency training in Haiti.[15] Similarly, Abedini et al[16] reported that Ghanaian medical students felt better equipped to serve patients in their own community after engaging in a bilateral exchange program with students from the University of Michigan.

Although the components of surgery, pathology, and anatomy were highly regarded, students reported that too little time was devoted to the research component of the program. Research is an underemphasized component in medical education in developing nations, with medical curriculums in Haiti and Rwanda containing little to no teaching on research methodology. Despite the large burden of disease in these nations and the need for good-quality research, future health professionals are given little to no experience on effective research methodology.[17] Future international efforts should focus on promoting the teaching of more rigorous research methodology in low- and middle-income countries.[18] Despite the findings that the research methodology component of the program needed to be restructured, it became an opportunity for Canadian students to learn about research focus in developing countries. Future iterations of the program will emphasize research design, statistical interpretation, and scientific writing skills, as suggested by Trostle[19] and Lefrere et al.[20] The international exchange also provided students with an opportunity to learn beyond the traditional learning environment. Students highlighted the importance of the exchange in developing personal growth, establishing personal and professional relationships, improving career development, and giving them the motivation to help their own community. In addition to the exchange being personally rewarding to the medical students involved, it also provided an opportunity to improve collaboration and partnership between the three institutions. Sustainable international partnerships are essential in global health, and will form the basis for future international work that will serve to mutually benefit all the parties involved.

The use of a near-peer teaching environment for medical students in a trilateral exchange program between Haiti, Rwanda, and Canada, that

Table 3. Selected Student Testimony Quotes Reflecting 3 Major Themes Regarding the International Program in Surgery, Pathology, Anatomy, Research Methodology, and Medical Education

Theme	Total number of respondents (N = 7) n (%)	Verbatim example
Personal development		
Personal growth: Greater awareness of one's self and one's own skills	6 (86)	"I think I became more mature. I saw how students in Canada are serious in there studies and it really helped me."
Travel: Opportunity of going abroad and exploring a country different from one's own	4 (57)	"Personally I really wanted to discover a new place."
Establishing relationships: Creating and maintaining relationships in a professional and nonprofessional context	3 (43)	"It was really exciting to come to Canada to meet new people … new students, and have new friends."
Professional development		
Professional growth: Development of knowledge and skills within the field of medicine	7 (100)	"This exchange really helped me to review my anatomy and also give me the confidence to begin to start learning all of this [medicine]."
Professional connections: Learning the value of networking with other medical students from across the world	3 (43)	"I feel that it's a real asset to have a global network of colleagues in the medical field, because I think we have so much to offer to teach one another."
Career development: Increased motivation to pursue a specific path within medicine	5 (71)	"My vision of the world is so much bigger. Now I want to be a traumatologist … my dream now is traumatology."
Responsibility: Sense of responsibility toward one's own community.	7 (100)	"It [exchange program] motivated me because now I know I need to work harder to try to be a good doctor to help my country to one day be like Canada in health care."
Diversity		
Cultural awareness and sensitivity: Greater appreciation for and sensitivity about cultural issues; increasing one's cultural skills	6 (86)	"When we started the exchange it was quite interesting because I got to learn a little bit of Haitian culture and some Haitian words."
Language barriers: Communication barriers between students	2 (29)	"Sometimes there was a bit of a language barrier between the groups. Even for me, English is my second language, so it was tough to find the terms to regroup all of us."
Health care differences: Understanding the similarities and differences in health care between countries	5 (71)	"From the Rwandan students I didn't know that they didn't have a lot of surgeons. I learned there is a big difference between Canada, Rwanda, and Haiti in health care. "
Differences in medical education: Understanding differences in medical school education	7 (100)	"From Rwanda it was useful to see that we were not the only ones who didn't have a dissection [program] in our country. It was new from them and us. It was good to understand that I am not alone."
Knowledge exchange		
Near-peer teaching: exchange of medical knowledge between medical students	6 (86)	"As much as the actual sessions themselves taught a lot of information, there was an equal amount learned just by formal discussions with other students."
Learning styles: Differences in learning styles and methodology of acquiring knowledge	4 (57)	"I had the opportunity to learn how other students from other parts of the world learn, what we have in common, and what they have better than us."
Teaching: Development of teaching skills	6 (86)	"I was also taught how to teach the skills I acquired back in Montreal which will make it easier to spread this knowledge back to my country [Rwanda]."

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focuses on surgery, pathology, anatomy, research methodology, and medical education is, to our knowledge, one of the first documented examples and provides insight into the feasibility and success of global health exchange programs. There exists limited evidence regarding the effects of international exchange programs and their design and structure, with most studies focusing on the perspectives of students from economically advantaged nations travelling to underresourced settings.[21,22] This program represents a pilot intervention demonstrating that a cross-cultural and near-peer teaching environments can be an effective method of medical student–centered development in global health. The reported program can serve as a model for other insitutions interested in pursuing similar collaborations.

ACKNOWLEDGMENTS

The authors acknowledge Dean Geneviève Poitevien of the Université Quisqueya, Port-au-Prince, Haiti, for her support and role in selecting the Haitian students to participate in the program. Support for this program was made possible through the funding released by the Dean David Eidelman of the Faculty of Medicine at McGill University, the Department of Global Surgery and Global Health at McGill University, which covered the trip expenses including the cost of flights, housing, visas, and travel insurance.

SUPPLEMENTARY DATA

Supplementary material for this article (http://dx.doi.org/10.1016/j.aogh.2017.04.003) can be found online at www.annalsofglobalhealth.org.

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