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Establishing a Simulation-Based Curriculum at a New Medical School in El Petén, Guatemala

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What is already known?

SBME is used in HICs and has proven benefits, but it is rarely implemented in low-resource settings.

What is new?

Creation of a student-driven SBME program in a rural Guatemalan medical school, including curriculum, materials, and local implementation challenges.

What does this imply or mean for global health?

HIC medical students can support sustainable educational infrastructure in LMICs, bridging gaps in clinical training.

Abstract

Introduction: Simulation-based medical education (SBME) is an integral component of medical education in high-income countries (HICs) but is less prevalent in resource-limited regions. Non-governmental organizations (NGOs), which have traditionally provided supplemental aid to these regions via supplies and labor, can strengthen the healthcare infrastructure by supporting local medical school education. Here, we outline our experience supporting development of an undergraduate medical simulation center in Northern Guatemala.

Methods: Partnering with Aid Via Action, an NGO, and our home medical school simulation program, we developed a simulation curriculum for the Universidad de Ciencias de la Salud Mariano Gálvez-Petén, a new medical school in Guatemala, and hand-delivered supplies. We catalogued the challenges and opportunities for improvement and planned for longitudinal assessment of the effectiveness of the SBME at this school compared to others at the same site.

Results: A curriculum was developed for 6 commonly simulated clinical techniques: nasogastric tube, foley catheter and Jackson-Pratt drain placement, cardiopulmonary resuscitation, surgical knot-tying, and pneumothorax treatment. The curriculum included skill indications, demonstrations with acquired resources, and important technical considerations. Immediate feedback from students and school leadership was positive. Obstacles arose regarding skill identification, communication, and the needs of the site.

Conclusion: Despite challenges, we were able to implement an SBME curriculum. Key factors in success included partnership with an NGO familiar with the site and collaboration with experienced faculty from our home institution. Immediate feedback was positive. Longitudinal assessment of curriculum utilization and effectiveness compared to other medical schools without an SBME is ongoing.

Keywords: medical education; simulation training; Guatemala; LMIC; medical students

"As medical students, we found an opportunity to create a program that reached our peers. This is an innovative concept in Global Health because it allows HIC medical students to contribute in a capacity promoting professional growth and development of local care providers."

Introduction

Guatemala is the most populous country in Central America.[1] Like most Central American Low- and Middle-Income Countries (LIMCs), Guatemala experiences

large disparities, particularly within medical care. As of 2023, 55.2% of the population is in poverty and about 35% the population is in poverty and about 35% of the country lacks access to basic health and nutrition services.[1] This lack of access is worsened by the low level of government spending on health as a whole – as little as 1.9% of Guatemala's gross domestic product.[2] With fewer resources aimed toward public health and training compared to high-income countries (HICs), the quality of practice is diminished.

Assistance to health care systems in LMICs is partially provided by Non-Governmental Organizations (NGOs). We believe that one of the goals of a successful organization should be to strengthen the infrastructure of the site they visit. A pivotal element in doing so within an LMIC health care system is assisting in teaching and training their future physicians. While most NGOs provide aid in the form of short mission trips (SMT), few focus exclusively on education. One such organization is Health Volunteers Overseas. Their model, which deploys a team of volunteers experienced in both clinical practice and education for two to four weeks at a time, focuses on assisting new healthcare providers; it does not account for the next generation of providers.[3] To our knowledge, no NGO has addressed assistance in medical student education from a HIC to an LMIC.

Aid Via Action Inc. (AVA) is a non-profit United States (US)-based NGO whose primary mission is to assist the medical needs of Northern Guatemala.[4] Based on the principles of ethics in medical volunteerism, we aim to not only bring experts from HICs to LMICs to deliver care, but to improve the infrastructure of an existing public hospital: Hospital Nacional de San Benito (HNSB).[5] Thus, surgeons and anesthesiologists from HICs participate in all cases with staff surgeons and anesthesiologists at the site. Similarly, residents and medical students from US-based programs also participate at HNSB. AVA's philosophy is to deliver HIC quality care in LMICs. The next step is to train medical students and residents with the standards of HICs. The narrative of this manuscript describes our initial efforts and pitfalls in establishing an educational program at a newly formed medical school in Northern Guatemala. Pivotal in this effort is the concept that this activity has been primarily driven by medical students from an HIC for medical students in an LMIC.

Materials and Methods

Simulation-based medical education (SBME) is a well-established teaching strategy in the United States, providing a pathway for students to acquire and refine clinical skills in a controlled and safe environment. The advantages of simulation in medical training include increased learner competency, improved patient and staff safety, and ideally minimized health care costs in the long term.[6] While HICs have embraced this approach, resource-constrained regions, such as Guatemala, often face significant challenges in providing comprehensive medical training opportunities.

Guided by this insight and with the assistance of AVA, we helped establish a SBME program at the Universidad de Ciencias de la Salud Mariano Gálvez (UCSMG), one of three medical schools in El Petén.[7] A branch of the Universidad de Mariano Galvéz, the UCSMG-Petén campus matriculated its first class of medical students in 2020. UCSMG- Petén has an established relationship with HNSB which is one of four public hospitals in the region and is the largest referral hospital, accounting for 250 general operations a month. HNSB is the only site where every local medical school sends students for required clerkship rotations.

The didactic portion of the UCSMG-Petén curriculum is taught in a four story, 44 classroom building that offers 18 other disciplines including nursing and veterinary medicine. Much of the curriculum is available via the school's online portal but in-person attendance is mandatory. A large classroom serves as the primary lecture hall, and a multifunctional lab and several smaller study rooms are nearby; one such room has been designated as the simulation center. The faculty at UCSMG requested assistance in the initial outfitting of the simulation center, including the equipment and curriculum to teach basic skills to medical students in their sixth semester of didactic curriculum, the equivalent of a US medical school second year student.

Utilizing the 2011 Association of American Medical Colleges (AAMC) Medical Simulation in Medical Education we identified the most frequently taught skills that were perceived to be the most portable and cost-effective.[8] Incorporating this, coupled with feasibility for implementation, and our experience as medical students needing training, we selected six techniques: nasogastric (NG) tube placement, indwelling bladder catheter and Jackson-Pratt (JP) drain placement and care, cardiopulmonary resuscitation (CPR), knot-tying, and pneumothorax treatment

We partnered with the University of Texas Southwestern (UTSW) Simulation Center to further develop the ideas and approach to carry out each skill identified with faculty experienced in developing SBME in LMICs. Additionally, the simulation center staff are well-versed in the application and construction of low-cost simulation models and were able to modify and donate surplus models to the project. These included 15 three-dimensional printed suture pads and knot-tying boards, along with three basic CPR models with adult and child depth settings. Equipment for the remaining simulation adaptations (NG tubes, Foley catheters, JP drains, chest decompression needles) were ordered from online sources utilizing a donation from AVA. Two NG tube manikins and 12 NG tubes were ordered along with 12 Foley catheters, three JP drains, and three chest decompression needles.

Collaboratively, we developed a simple curriculum to be delivered via slide presentation that included general indications for the skill, a demonstration utilizing a combination of pictures, text and videos, and important considerations for proper or efficient technique. Utilized videos were obtained from online free resources (e.g., YouTube) and chosen for brevity (<5 minutes/each), clarity of demonstration, and availability of Spanish audio or subtitles. For the knot-tying skill, we linked a website translated into Spanish utilizing the Google Translate Website widget (Alphabet Inc., Mountain View, California). Examples of considerations for efficient technique included proper set-up for tube placement and removal, appropriate depth of chest compressions in CPR, and potential procedural complications. An online slide presentation format was utilized because it could be easily referenced by UCSMG students on their own time and by faculty who will oversee the skills practice sessions. The presentation itself was initially documented in English and translated to Spanish by the UCSMG-Peten faculty author and reviewed for accuracy and safety by both faculty authors.

Results

The SBME center was officially inaugurated on November 10, 2023. All materials were hand-delivered by a medical student in the group (JH) who also provided instructions for proper utilization.

Immediate verbal feedback from medical students, junior and senior leadership was positive.

We faced a number of challenges in helping establish this SBME center. The first was defining the scope of the project. The idea of building a simulation program was daunting, especially when we considered what is offered as part of our home institution's SBME. Our review of the literature, while helpful, did not yield a transferable model to imitate. By seeking guidance from UTSW simulation professionals, understanding scale and generalizability from background research, and through partnership with AVA, we identified resources and skills, allowing us to develop the curriculum presented in this manuscript and inaugurate the program.

Our second challenge was determining how to best leverage our strengths while recognizing weaknesses. We utilized our own questions and apprehensions as second-year US medical students to guide skills and key information we felt would be most beneficial to students preparing for their first rotations. Additionally, the Spanish language fluency of one medical student in the group (EM) was helpful in communicating with the site. The prior experience of the other medical student (JH) as a surgery-based physician assistant aided in the development of some of the skill curricula. However, neither of us has experience with NG or thoracostomy tube placement, which was one factor resulting in delivering NG tubes that were not the most representative of an adult population. We also failed to consider adjunctive materials needed for some of the skills e.g., lubricating jelly and syringes for Foley catheter insertion.

Other challenges in this project included difficulty finding appropriate Spanish-language videos for our curriculum and the relative unavailability of the faculty at UCSMG-Petén. We found that although the site was enthusiastic about the curriculum and equipment, the faculty's other duties precluded providing substantial guidance or feedback. We were not able to visit the site during the planning stage, making it paramount that we hand-deliver the materials and be present for the inauguration to establish rapport for future phases of the project.

Discussion

From the outset of this project, we knew materials and equipment needed to be durable, portable, and inexpensive. These factors were integral in determining which skills to include in the curriculum. The UTSW simulation center supplied many materials and helped us identify cost-feasible resources to obtain others. Our original intent was to obtain knot-tying boards from a large company; however, the company no longer donates these boards. The simulation center was able to supply surplus knot-tying boards, and we created practice 'sutures' using rope and colored markers purchased from a hardware store. Additionally, the simulation lab printed suture pads, which we will incorporate in a later phase of the project [Figure 1]. Other options for low-cost suture 'pads' include oranges and bananas, which can often be obtained locally. While pigs' feet offer a more realistic suturing experience, they are less feasible due to the need for refrigeration and inconsistency with some religious practices. We also found how materials could be utilized outside of their intended use. For example, with minor modifications, CPR models can be utilized for NG tube placement and surplus manikin genitalia can be outfitted with water bottle "bladders" to serve as Foley catheter models.

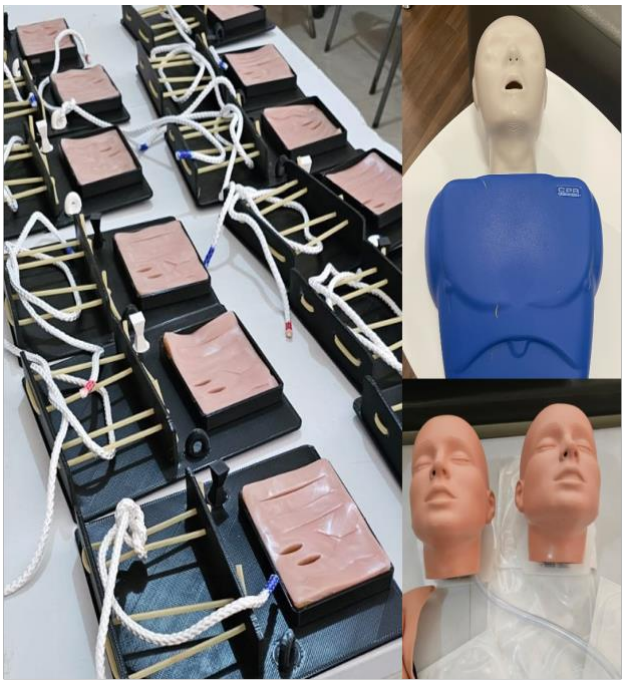

Figure 1. Simulation Equipment, clockwise from top right: CPR manikin, NG tube simulator, suturing/knot-tying boards

Perhaps the greatest challenge to developing and delivering an effective curriculum to an LMIC is determining its suitability. Collaboration is a defining feature of Global Health (GH); however, in LMIC settings, limited facilities and personnel – whether due to shortages of local faculty, staff, or available volunteers – can hinder the ability to co-develop curricula that are responsive to the true needs of the students. While we selected skills we believed suitable for Petén, at this juncture these issues remain unanswered. For instance, is there utility in teaching a basic skill like CPR if emergency services are not available to sustain the patient following initial resuscitation?

While the initial feedback from UCSMG-Petén faculty and students has been positive and they have implemented the tools and techniques, we need to continue to assess the factors outlined above to qualify the results and implement changes in the future. To do so, we have developed feedback measurement tools in coordination with our co-authors in Peten, including learner and teacher surveys. We plan to compare the advantages of having a simulation curriculum by collecting objective data from other groups rotating at the same hospital as UCSMG-Petén students. However, it will require considerable time and coordination and thus will not be the most immediate feedback metric. As with other SMTs, we believe that metrics are most important for those on the receiving end, i.e. the students in Guatemala.[9]

Despite its challenges, the incorporation of a tailored SBME into an LMIC's medical school curriculum should prove to further education and patient care. The idea of simulation is not a new concept in medicine, with anatomical models dating back centuries. In the United States and other HICs, there is no doubt of simulation's efficacy to enhance medical student education. In these countries, the use of simulation within medical training is ubiquitous and has expanded to include high-fidelity manikins, virtual reality, and artificial intelligence.[10] UTSW has pioneered strategies to enhance medical student and resident education. The current simulation center was built synchronously with the development of a competency-based curriculum incorporating the AAMC's "Core Entrustable Professional Activities (EPAs) for Entering Residency." This curriculum includes 25 modules felt to best represent these EPAs.[11] A similar undertaking in an LMIC is unrealistic to replicate and difficult to implement due to resource allocation limitations. Still, our experience and research indicated that if we can bring health care personnel for SMTs to bridge the gap of the medical needs of the site, then we could do the same with medical student education, representing a crucial step in self-sustainability.[9]

A growing body of literature describes the use of SBME in LMICs. One notable success is the Helping Babies Breathe curriculum, an American Academy of Pediatrics simulation that utilizes a mix of role play for first level birth attendants in neonatal resuscitation.[12] The curriculum, specifically designed

for low-resource settings, has been utilized in more than 80 countries with significant decreases in first-day neonatal mortality.[12] Another program with success in LMICs is the Programa de Rescate Obstétrico y Neonatal: el Tratamiento Óptimo y Oportuno International designed curriculum, which uses a combination of low-cost simulation tools and video-recorded scenarios to optimize emergency obstetric and neonatal care.[13] While there are studies documenting medical simulation in Guatemala, these programs are at hospitals in Guatemala City, which have quite different resources than rural Guatemala, including advanced life support capabilities and developed simulation centers. [14,15]

The bulk of LMIC simulations focus on practicing healthcare workers.[16] Integration with undergraduate medical education is lagging, but certain initiatives provide a foundation for change. The Medical Education Partnership Initiative (MEPI) was a grant program funded by the US President's Emergency Plan for AIDS and the National Institutes of Health, distributing $130 million to 13 medical schools in sub-Saharan countries combating the African health worker crisis. MEPI prioritized medical schools and academic institutions to upgrade the quality of education, research endeavors, and medical field retention.[17] MEPI also helped catalyze a push for new doctors to 'stay home' after graduating and entering their profession. For instance, prior to MEPI funded intervention at the University of Zimbabwe College of Health Sciences, 80% of students indicated that they did not intend to remain in the country for work. Following MEPI implementation, 82% indicated the opposite, that they were willing to remain in Zimbabwe following graduation.[17]

While government assistance to medical schools has increased through projects like MEPI, to our knowledge, no NGO initiative addresses medical student education. As medical students, we found an opportunity to create a program that reached our peers. This is an innovative concept in GH because it allows HIC medical students to contribute in a capacity promoting professional growth and development of local care providers [Figure 2]. As junior medical students, we recognize that our ability to sustain personal involvement is necessarily shaped by the duration of our time at UTSW. However, we plan to remain engaged with the outcomes of this SBME initiative both during medical school and beyond, by maintaining communication with our Guatemalan partners and reviewing successes and shortcomings of the current curriculum, supporting future cohorts of UTSW students who wish to participate, and seeking opportunities to integrate similar medical education projects into GH junctures of residency. In this way, our own engagement is intended to model a form of longitudinal involvement that extends beyond the short-term immersion often associated with 'global health tourism', underscoring the value of continuity, relationship-building, and long-term capacity strengthening even as our institutional affiliations evolve.[18]

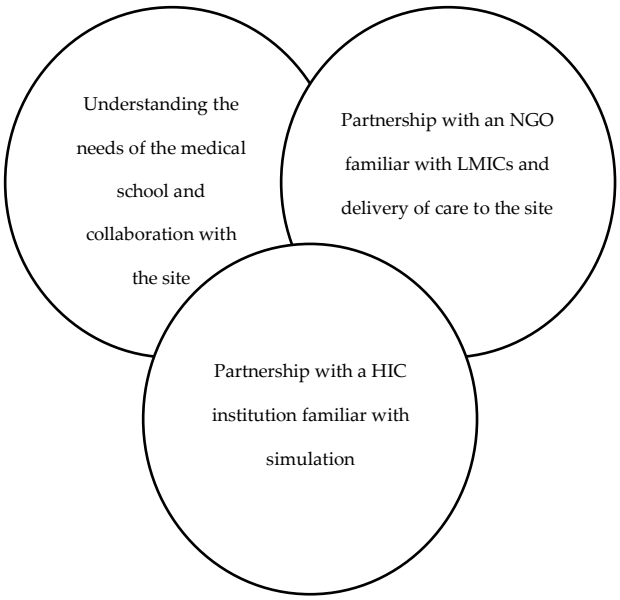

Figure 2. Navigating the steps towards developing an SBME curriculum.

Conclusions

Introducing SBME curriculum to an LMIC can transform healthcare delivery in profound ways. It is

our hope that by supporting its development for a medical school, we can bridge the gap between more traditional teaching experiences and real-world application. This is particularly beneficial in a resource-limited setting like rural Guatemala where clinical training may be hindered by inadequate patient volume, teaching modalities, or limited exposure. This program's success could help increase attention to the use of simulation in undergraduate medical education within LMICs and potentially increase retention of newly graduated doctors within the region.

References

1. Huerta S. Health Care in Central America. Editorial. *Aid Via Action Global Health Journal*. 2023;1(1):1-5. doi:10.5281/zenodo.7618857

2. Bowser DM, Mahal A. Guatemala: the economic burden of illness and health system implications. *Health Policy*. May 2011;100(2-3):159-66. doi:10.1016/j.healthpol.2010.11.011

3. MacNairn E. Health Volunteers Overseas: A Model for Ethical and Effective Short-Term Global Health Training in Low-Resource Countries. *Global Health: Science and Practice*. 2019;7(3):344-354. doi:10.9745/ghsp-d-19-00140

4. Huerta S. Aid Via Action Inc. April 19,2025. www.aidviaaction.org

5. Stone GS, Olson KR. The Ethics of Medical Volunteerism. *Med Clin North Am*. Mar 2016;100(2):237-46. doi:10.1016/j.mcna.2015.09.001

6. Al-Elq AH. Simulation-based medical teaching and learning. *J Family Community Med*. Jan 2010;17(1):35-40. doi:10.4103/1319-1683.68787

7. Universidad Mariano Galvez-Peten G. USMG-Peten. Accessed 6/10/2025, 2025. www.ucsmg-peten.org

8. Passiment MS, H.; Huang MD, G. . *Medical Simulation in Medical Education: Results of an AAMC Survey*. 2011. https://careersinmedicine.aamc.org

9. Huerta S, Huchim-Pena CJ, Ta T, et al. Patients', Local Staff, and Medical Students' Perceptions on a Medical Mission Trip to Guatemala. *Curr Probl Surg*. Nov 2023;60(11):101378. doi:10.1016/j.cpsurg.2023.101378

10. Dhar E, Upadhyay U, Huang Y, et al. A scoping review to assess the effects of virtual reality in medical education and clinical care. *Digit Health*. Jan-Dec 2023;9:20552076231158022. doi:10.1177/20552076231158022

11. JJ Weis JW, DE Farr, C Ginsburg, O Guttmann, K Hoggatt Krumwiede, KA Kho, J Martinez, G Reed, RV Rege, MS Sulistio, DJ Scott. The integration of a new simulation center within a Competency-Based Curriculum: an opportunity for holistic undergraduate medical education curriculum redesign. *MedEdPublish*. 2018;7(137)doi:(https://doi.org/10.15694/mep.2018.0000137.1)

12. Kamath-Rayne BD, Thukral A, Visick MK, et al. Helping Babies Breathe, Second Edition: A Model for Strengthening Educational Programs to Increase Global Newborn Survival. *Glob Health Sci Pract*. Oct 3 2018;6(3):538-551. doi:10.9745/GHSP-D-18-00147

13. Walker DM, Holme F, Zelek ST, et al. A process evaluation of PRONTO simulation training for obstetric and neonatal emergency response teams in Guatemala. *BMC Med Educ*. Jul 24 2015;15:117. doi:10.1186/s12909-015-0401-7

14. Zickuhr L, Bery A, Rivera-Pineda J, Wallendorf M, Murray D, Zajarias A. The effect of simulation education in teaching senior medical students advanced cardiovascular life support at a public teaching hospital in Guatemala city, Guatemala. *Annals of Global Health*. 2015;81(1):180-180.

15. Lopez-Herce J, Matamoros MM, Moya L, et al. Paediatric cardiopulmonary resuscitation training program in Latin-America: the RIBEPCI experience. *BMC Med Educ*. Sep 12 2017;17(1):161. doi:10.1186/s12909-017-1005-1

16. Puri L, Das J, Pai M, et al. Enhancing quality of medical care in low income and middle income countries through simulation-based initiatives: Recommendations of the Simnovate Global Health Domain Group. Article. *BMJ Simulation and Technology Enhanced Learning*. 2017;3:S15-S22. doi:10.1136/bmjstel-2016-000180

17. Omaswa F, Kiguli-Malwadde E, Donkor P, et al. The Medical Education Partnership Initiative (MEPI): Innovations and Lessons for Health Professions Training and Research in Africa. *Ann Glob Health*. Apr 30 2018;84(1):160-169. doi:10.29024/aogh.8

18. Hocking J, Huerta S. The crisis of global health tourism: Review of the current status of global health in undergraduate medical education. *Am J Surg*. May 19 2025:116427. doi:10.1016/j.amjsurg.2025.116427