

# Integrated Ultrasound Curriculum in Undergraduate Medical Education: An Opportunity for Global Health Engagement and Early Faculty Development



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# Introduction

- Early integration of ultrasound teaching in undergraduate medical education provides students with skills they will use throughout their careers regardless of specialty choice.
- Given a unique opportunity to immediately apply their ultrasound knowledge as instructors for practicing physicians in a humanitarian setting, these students gain early exposure to a number of additional aspects of clinical medicine.
- In this presentation, we detail the content of our ultrasound curriculum and ask how such experiences influence early student perceptions of the involved disciplines.

*\*Disclaimer: The views expressed in this poster presentation are those of the authors and do not reflect the official policy of the Department of Navy, Department of Defense, or U.S. Government*



# I. Ultrasound Curriculum: MS I-II

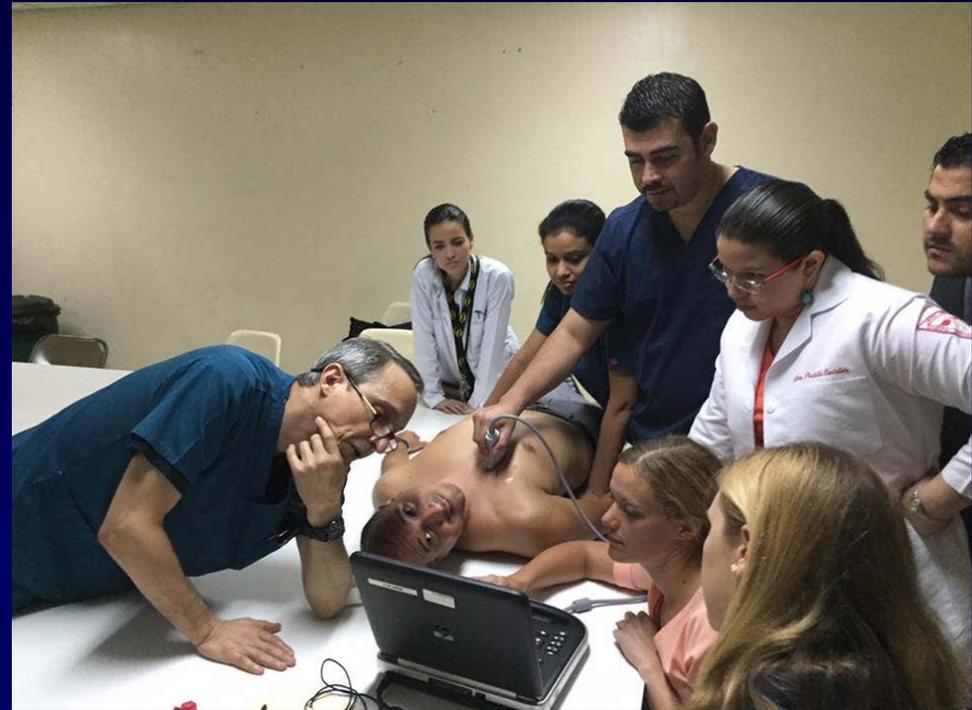
- All first and second year medical students at the Uniformed Services University of the Health Sciences, F. Edward Hebert School of Medicine receive didactic and hands-on training through an 18-month course in Bedside Ultrasound which is integrated into a systems-based curriculum.
- Course content was developed by a fellowship trained Emergency Medicine physician.
- After the first 12 months of instruction, the students are then given the option of enrolling in a three-week “Summer Operational Experience” (SOE). During this summer program, the students receive an additional 40+ hours of instruction in a week-long, intensive, didactic, refresher course in advanced ultrasound techniques. They then depart on a two-week mission aimed at teaching bedside ultrasound to physicians serving disadvantaged populations within the US Southern Command Area of Responsibility (South-Com AOR) as well as multidisciplinary providers within the local Army Medical Element.

ULTRASOUND TOPICS	
Right upper quadrant	Central Venous Access
Musculoskeletal	Rapid US in Shock
Renal	Pelvic US
Deep venous system	Abdominal Aorta
Cardiothoracic	Ocular



## II. USU SouthCom-AOR Mission Honduras: July 18<sup>th</sup> - July 29<sup>th</sup>, 2016

- Following the refresher course, the students travel with university faculty to educate >200 Honduran physicians who treat disadvantaged populations on the use of ultrasound at the bedside.
- Faculty includes two Emergency Medicine physicians and one Radiologist.
- Medical students provide the majority of the hands-on practical teaching with faculty assistance.
- Following didactics and practicals, learners spend 1.5 to 3 hours performing ultrasound exams on their own patients under faculty supervision.



# USU SouthCom-AOR Mission

- Courses range from one to two days (8 to 16 hours) and were ~ ½ lecture and ½ hands-on practical scanning (ultrasound image acquisition by the course participants).
- For the first week in Tegucigalpa, lecture content is delivered in English by the USU faculty. Second-year medical students fluent in Spanish translate the lectures on the fly.
- During the second week in San Pedro Sula, lecture content is primarily delivered in Spanish by fluent second-year medical students.



# Course Objectives

1. Train providers in the practical use of bedside (physician-performed) ultrasonography for the rapid diagnosis of potential life-threatening injuries and/or pathology to improve medical decision-making.
2. Review the utility of the FAST (trauma) exam for triage and transfer/evacuation decisions.
3. Discuss and practice ultrasound applications for common pathologies and procedures including cholecystitis, nephrolithiasis, gynecologic emergencies, US-guided vascular access and nerve blocks.
4. Recognize the limitations of ultrasound.



# Mission Itinerary

1. Tegucigalpa – Hospital Escuela – 103 Participants
  - Day 1– General Surgery (14)
  - Day 2– Internal Medicine/Critical Care (14)
  - Day 3– Anesthesia (18)
  - Day 4– Urology Physicians and RNs (19) , OB/GYN Physicians (14)
  - Day 5- Pediatrics (24)
2. Tegucigalpa – Social Security Hospital – 16 Participants
3. Sato Cano – Joint Task Force Bravo MEDEL – 11 Participants
  - Health Care Specialists, Physicians, Physician Assistants, and JSOC Medics
4. San Pedro Sula – Hospital Mario Catarino Rivas – 23 Participants
  - General Surgery
5. San Pedro Sula – Social Security Hospital – 44 Participants

Department of Surgery

  - Day 1– Catholic University of Honduras *Our Lady Queen of Peace*
  - Day 2– Honduran Institute of Social Security
6. San Pedro Sula – Hospital De Area El Progreso– 22 Participants
  - General Surgery



# Benefits for Host Nation Providers

- Providers became aware of the potential applications of ultrasound and how it can minimize unnecessary procedures, improve triage, decrease complications, and reduce costs.
- A total of 219 host nation providers and 11 JTF-bravo MEDEL personnel were trained.
- Hands-on teaching gave each provider more confidence and experience in image acquisition.
- Information was provided for the Honduran hospitals to acquire reasonably priced refurbished ultrasound machines via the Sonosite “Sound Caring” program.



# III. Post-Course Observations

Approximately 5 months following mission completion, the student-educators reflected on how the experience changed their perceptions of a number of disciplines they were exposed to. These include: Humanitarian medicine, Academic medicine, Radiology, Emergency medicine, and Operational Medicine.

## Humanitarian Medicine

- Although available in many low-income, low-resource hospitals, ultrasound is often sub-optimally utilized.
- The careful assessment of needs is critical in humanitarian operations and donations without understanding the context can be unhelpful: Discovering an ultrasound machine without trained sonographers became a common theme on our mission. One facility even owned a portable ultrasound with no power cable included.
- It was clearly evident that effective use of ultrasound made an impact on several patient care decisions during hospital rounds.
- Even a small-footprint, low-cost mission may offer far-reaching and lasting impact.
- Investing in the education of host nation physicians has the potential to improve patient care long after the conclusion of the mission.



# Humanitarian Medicine, cont.

- The ability to utilize imaging efficiently to triage patients in a setting with limited medical resources illustrates the central role that imaging plays in clinical decision making. The low cost and portability of ultrasound make it especially well-suited to such settings.
- The US military benefits through subject-matter expert exchanges, enhanced health diplomacy, and host-nation medical capacity-building.
- Student-teachers recognized not only academic and professional benefit, but also noted a broadening of their global outlook.
- Following the experience, several students highlighted their bolstered commitment to pursue opportunities for humanitarian outreach during their military careers.



# Academic Medicine

The unique qualities and skills of our student body were key to the success of this mission. Our student educators consisted of talented individuals with outstanding language skills and extensive, distinguish careers prior to medical school. For these reasons, our students were primed to assume the role of teachers so early in their medical school careers.

- This experience provided both the immediate gratification of assisting with diagnoses in a foreign hospital, but also the satisfaction of knowing that our instruction would benefit Honduran doctors and patients long after we left.
- The opportunity to discuss ideas as well as teach and learn from peers drove home the importance of collaboration, and how crucial it is to academic development.
- Many students noted that teaching Honduran physicians provided the opportunity to internalize the skills and deepen the knowledge acquired during the academic year.
- Offering education as diplomacy benefited the teachers as well in that they were able to learn from peers in a different country and medical system.
- One student-teacher commented, “the term "subject matter expert exchange" was used frequently throughout the trip, and though I would not yet consider myself an expert in ultrasound, I now see that there can be immense benefits for both parties when such exchanges occur”.
- Numerous students found teaching to be a very rewarding experience and now plan to pursue a career in academic medicine in the future.



# Emergency Medicine

- Gained an appreciation of EM as not only the experts in acute illness but masters of multiple organ systems. This broad knowledge base was appealing.
- Recognized the utility of bedside ultrasound in the ED; helped dispel the notion that triage and stabilization were the sole tasks in the ED.
- Displayed the wide applicability of ultrasound across medical specialties.
- Entering the clerkship year, students see their knowledge of ultrasound as a unique skill that may facilitate meaningful contributions to patient care, and perhaps set them apart from medical students who trained in different programs.
- Many components of the course demonstrated how crucial ultrasound can be in triage and evaluation in the ED. To be able to have instant imaging at the bedside to aid in time-critical decision-making is remarkable.



# Radiology

Prior to the implementation of the ultrasound curriculum, exposure to medical imaging was limited in the pre-clinical years. Even during the clerkship years, medical students have few opportunities to primarily interpret images. Our students relayed the following impressions of the field:

- Learning and applying ultrasound so early in the medical school curriculum cemented knowledge of anatomy and pathology.
- Students remarked on the impact and central role of imaging in directing patient care.
- Unexpected satisfaction of being able to interpret real time imaging, a task not often attempted until residency.
- Increased motivation to make ultrasound a credentialed skill set regardless of specialty choice.
- Being directly involved in the entirety of the imaging process, from image acquisition to interpretation and recommendation, allowed appreciation of the skill involved in obtaining valid data on which medical decision-making can be based.



# Operational Medicine

All medical students at USU are uniformed officers with a common purpose - to dedicate their medical careers to supporting the warfighters of the US Armed Forces. Many of our graduates will deploy in direct support of our forces abroad. Missions such as these allow our students to gain insight into how their efforts support these troops.

- Ultrasound is a uniquely privileged modality in the operational setting due to its portability and instantaneous feedback. Students recognized that, in certain forward-deployed settings, these factors guide appropriateness criteria decisions. This highlights the creativity and adaptability required in the operational realm.
- Using a tool that has been optimized for use in austere environments made operational medicine more tangible, and demonstrated the impact it can have on care in the field.
- Gained satisfaction through providing education to military special forces teams (at JTF Bravo).
- The experience increased desire to participate in operational medicine during military career.



# Conclusion

Given the unique imaging curriculum and opportunity to apply that knowledge in a humanitarian setting, the participants were able to gain in-depth experience in several areas of clinical medicine much earlier than most medical students have an opportunity to do so. Such early exposure significantly influences perception of and interest in several disciplines to include: Humanitarian Medicine, Operational Medicine, Radiology, Emergency Medicine, and Academic Medicine. Students gained a deeper understanding of and appreciation for each of these fields. Future studies are needed to investigate whether such programs ultimately influence specialty choice in the long term.

