

Do Plans and Execution Agree in a Humanitarian Medical Mission?

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There is a significant need for orthopaedic care in developing countries. For the past 10 years, the United States Army has supported annual orthopaedic hand surgery humanitarian missions to Honduras. The goal of this article is to compare the premission planning to the realities of mission execution to provide a template for future missions. Premission planning began 1 year before the mission. Based on previous missions, supplies were brought for 50 surgical cases. The mission began with 1 preoperative clinic day followed by 8 operative days and 1 postoperative clinic day. Of the 99 prescreened patients, 65 were indicated for surgery. A total of 58 surgeries were performed using innovative methods to stretch available supplies. A multidisciplinary and multination concerted effort is required for a successful humanitarian medical mission. A premission plan is critical prior to arrival and a contingency plan must be in place for missing mission-critical items. (Journal of Surgical Orthopaedic Advances 20(1):67–73, 2011)

Key words: hand surgery, Honduras, humanitarian mission

There is a great need for orthopaedic health care in developing countries as orthopaedic injuries are among the leading causes of disability worldwide. Due to the limited access to health care systems in many developing countries and the shortage of health care professionals, the burden of orthopaedic disease is great (1). Historically, orthopaedic health care providers in developed nations have been leaders in international health care, as demonstrated by the establishment of pioneering organizations such as Orthopaedics Overseas in 1959. Vaccination programs and preventative medicine have appropriately had better funding and a higher profile (2, 3), but with the relative success of these programs, the demand for orthopaedic care continues to far outstrip resources.

For the past decade, the United States Army has supported an orthopaedic hand surgery humanitarian mission in Honduras, Central America. Over time, this annual mission has become an effective means of assisting the local population with surgical care in the specialty of orthopaedic hand surgery and has become an exceptional

learning experience for health care providers. Through this experience, some institutional memory has developed regarding the key elements of planning and executing such a mission.

The goal of this article is to compare the assumptions of the premission planning to the realities of the execution of the mission, in an effort to improve the process. Secondary goals are to offer insight into the inner workings of such a mission and to provide a template for future humanitarian efforts, either by the United States military or other organizations. To the authors' knowledge, there are no previous articles in the orthopaedic literature that address humanitarian mission planning or execution. The hypothesis is that a premission plan is critical prior to arrival, the surgical team must be flexible and adapt to a myriad of potential scenarios, and a contingency plan must be in place for missing mission-critical items.

Honduras is a Central American nation of 7.8 million people and is the third poorest country in the Western Hemisphere. An estimated 3.7 million people, roughly 51% of the population, are below the poverty line (4, 5). The Honduran national government, through the Ministry of Health, offers universal health care, but due to limited government resources, emergency care is the primary focus of the health care system. Patients requiring none-emergent or elective surgical care are often subjected to long waiting periods, which can be years in some cases. There is a two-tiered system, distinguished between the free public hospitals with rationing of care and the private system where immediate care is available for patients with the ability to pay. Therefore, while there are physicians and hospitals equipped for providing care to these patients, there is a large case backlog that results in a high burden of

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pathology in the indigent population. An area of particular need is elective orthopaedic surgical care.

Methods

Support and Funding

The medical mission discussed in this article is classified as a medical readiness training exercise (MEDRETE). It is funded by United States Southern Command, a joint U.S. military organization responsible for military operations and planning in South and Central America and the Caribbean. MEDRETEs are opportunities provided to interested military medical organizations to train their personnel in practicing medicine in a challenging and austere environment and treat medical conditions not commonly experienced in the U.S. population. The local health care providers develop stronger relations with U.S. medical personnel, and the native population benefits with improved medical care, enhancing security and stability in the region. In fiscal year 2009 military personnel conducted 89 MEDRETEs in 18 countries, treating about 235,000 people (6).

Mission Concept

The goal of this particular MEDRETE was to provide medical care in the area of orthopaedic hand surgery to the underserved population in Tegucigalpa, Honduras, while providing a unique training opportunity for the health care team. The target population was working-age indigent adults with severe hand and upper extremity pathology. Examples of prior common diagnoses included acute and chronic tendon and nerve injuries, burns, contractures, and congenital defects. The MEDRETE team consisted of 17 members as listed in Table 1. The team planned to bring

TABLE 1 MEDRETE team members

Surgical team
2 fellowship-trained hand surgeons
1 hand fellow
3 orthopaedic surgery residents
Anesthesia team
1 anesthesiologist
2 anesthesia residents
Operating support staff
3 surgical technicians
1 surgical nurse
Therapists
2 occupational therapists
Administration
1 medical service corps executive officer
1 medical service corps senior enlisted noncommissioned officer

supplies and equipment in order to be as self-sufficient as possible. However, host nation support was critical in providing clinic and operating room space, the hospital facilities to provide inpatient care, and prescreening of potential surgical candidates. The ability to coordinate these mission-critical requirements was facilitated by Joint Task Force Bravo (JTF-B), the United States military liaison in Central America.

Planning

Pre-mission planning was begun one year in advance, and an outline is provided in Table 2. The key components of the planning process are discussed below.

Personnel

Any humanitarian mission is dependent on motivated and competent health care providers who have an interest in international health. In this situation uniformed military personnel made up the team, all of whom volunteered for the mission. All are employed at one of the two largest Army teaching hospitals in the United States. Seven of the 17 team members had been on previous MEDRETEs in Honduras.

Administration

A significant and mission-critical portion of planning involved meeting key administrative deadlines. All members of the team required current passports, immunizations, and security clearances as well as completion of required training as dictated by the U.S. Army and State Department. In addition, all medical providers were required to submit their licensing credentials to Honduran authorities to gain approval to practice medicine in Honduras. Travel arrangements for personnel via the military travel system were also arranged. Much of this work was done by the two administrative members of the team without clinical responsibilities.

Travel

The majority of the team used commercial airlines for transportation and all team members were lodged in a local hotel in Tegucigalpa. A few members of the team traveled via military aircraft in order to accompany mission-critical supplies that were transported in this fashion.

Equipment and Supplies

The area of planning that required the most attention to detail was selecting, ordering, transporting, and confirming receipt of the supplies and equipment needed to complete the surgical mission. Any items neglected

TABLE 2 Planning timeline

Days From Arrival	Visiting MEDRETE Team	Host Nation Team
-365+	MEDRETE request submitted to U.S. Southern Command; identification of team commander	Communication with MEDRETE team commander regarding training goals of mission, including target pathology
-270	Dates of mission finalized, including preoperative clinic date. Budget finalized with MEDRETE approval	Identification of surgical candidates begins with lead local physician liaison as point of contact, and cooperation of local surgeons and government organization
-180	Possible team members identified	Operating rooms and clinic spaces at hospital reserved for appropriate dates
-120	Team members finalized; requests for input on needed supplies and equipment; initiate administrative requirements (passports, medical licenses, immunizations, DOD required training)	Medical license transfers for visiting personnel requested via host nation health care government agencies and hospital
-90	Formal request for visiting surgical team sent to host nation via U.S. State Department; supplies and equipment lists finalized and ordered	Prescreening clinics held by local physicians; maximize occupation therapy; other nonoperative measures; required medical supplies ordered by local officials
-60	Travel and lodging arrangements finalized	
-30	Confirmation of arrival of needed medical supplies	Confirmation of arrival of needed medical supplies
-1	Arrival of advance team in country with portion of medical supplies; confirms receipt of all ordered medical supplies	
0	Arrival of team in country	
+1	Staging of supplies; set up operating room	
+2	Preoperative clinic; surgical cases identified and surgical schedule established	
+3	First surgical day	Postop recovery and inpatient care as needed
+12	Last surgical day	
+13	Postoperative clinic	Joint effort to communicate and document postoperative plan to local physicians
+14	Team departs back to the United States	
+15	Continued communication regarding patient care should questions arise regarding care provided	

were required to be identified early and alternative plans made; otherwise, the surgical mission would be jeopardized. Supplies at the host nation hospital were often scarce or inadequate. However, the team was dependent on the host nation for daily sterilization of equipment and use of an operating microscope. A mission-critical supply list for the MEDRETE team has been refined over time based on previous missions.

The materials needed for the mission were separated into two groups: those to be transported with the team from the United States via military aircraft, and those to be ordered and shipped directly to Tegucigalpa from the manufacturer. In this case, those items shipped were ordered, received, and stored by JTF-B personnel within Honduras. Those items were required to be ordered with a significant lead time in order to ensure timely arrival.

As many items as possible were planned to be transported with members of the team via military aircraft, to maintain control over these mission-critical items. However, weight restrictions limited this shipment to 3000 pounds. Also certain items required special transportation conditions, specifically any medical fluids or gases. Additionally, controlled substances such as anesthetics and

narcotics were more conveniently shipped directly from the manufacturer due to regulations regarding transportation of these materials. Decisions to ship via military aircraft or ship directly from the manufacturer were made based on these considerations. Prior experience from team members suggested that it was best to bring as many items as possible via military aircraft so these items were under direct control of the team, but this was not possible for all items based on the restrictions in place.

Supplies were brought to support 50 operative cases based on previous caseload experience. Surgical implants included were limited to small fragment sets, modular hand sets, and Kirshner wires, because most cases were anticipated to be soft tissue procedures, and the expense of more advanced implants was cost-prohibitive. A summary of the supply list is included in Table 3. Anesthesia was planned to be primarily accomplished by regional blocks whenever possible, supplemented by intravenous sedation and monitored anesthesia care. A minimal number of general anesthesia cases were planned. Also, no pediatric patients were anticipated based on the prescreening done by our host nation liaisons.

TABLE 3 Surgical team supplies

Reusable Surgical Instruments	Disposable Sterile Items	Nonsterile Items
Hand & foot sets	Electrocautery supplies	Hand tables
Small fragment set	Doppler supplies	Nitrogen
External fixator set	Kirshner wires	Nitrogen tank hoses
Tendon/nerve set	Sutures	Nitrogen regulators
Microvascular set	Scalpel blades	Doppler machines
Modular hand set	Gowns/gloves/sleeves	Electrocautery machines
Iliac creast bone graft set	Drapes	Tourniquet machines
Major orthopaedic set	Suction/tubing	Tourniquets
Osteotomes	Lap sponges/raytecs	Splints/casting supplies
Dermatomes	Skin markers	Surgical prep solutions
Meshes	Hand towels	Surgical scrubs soaps/brushes
Electric surgical tools	Irrigation fluid	Scrub shirts/pants
Pneumatic surgical tools	Surgical drains	Head covers/masks/shoe covers
Hand-powered drill	Needles/syringes	Hair clippers/razors
Saw blades	K-wire covers	Normal saline
Drill bits	Steri strips/mastisol	Local analgesics
Lead hands	Vessel loops	Sharps disposal containers
Sterile cups/basin/pitchers	Hunter silicone rods	Cloth/paper/silk tape
	Ligaclips	
	Staplers	
	Sterile dressings	
	Ioban/tegaderm	
	Foley sets	
	Surgical prep trays	
	Sterilizing envelopes	
	Sterilization wraps	

Security

Key elements of the security plan were selection of lodging in an area of Tegucigalpa with a low crime rate, transportation to and from the hospital by JTF-B personnel familiar with the local environment, and restricted travel for MEDRETE team members. Any travel had to be made in groups of four or more, and nighttime travel was limited to those approved by the mission commander. Curfew was set at midnight and daily personnel counts were conducted. All team members attended a security brief the first day of the mission with information about the most likely threats to U.S. personnel in Tegucigalpa. Controlled substances were transported to and from the hospital by team personnel with usage documented appropriately. Equipment and supplies were all stored and locked in the operating rooms overnight. Key team personnel were equipped with government cellular phones to facilitate communication between team members and JTF-B. Contingency plans for unexpected events were coordinated between the team executive officer, the United States Embassy, and JTF-B and are beyond the scope of this article.

Host Nation Support

The U.S. Department of Defense via the U.S. Southern Command has placed an emphasis on multinational cooperation in humanitarian medical missions in developing

countries. Within Honduras, JTF-B is the military organization that facilitates these missions. In addition to active duty military personnel, JTF-B employs several native Honduran physicians to serve as liaisons between U.S. military health care providers and Honduran physicians and patients. These physicians are born, raised, and trained in Honduras and have many contacts within the Honduran health care system. They are an invaluable asset to have on the ground to identify patients who may benefit from the mission, make arrangements for the patients to be seen by the surgical team, and provide continuity of care for the patients once the mission has been completed.

In this situation, the surgical team coordinated with one such Honduran physician. This general practitioner collected information of potential surgical candidates through his own clinical practice as well as through the Honduran Ministry of Health and hand surgeons who practice elsewhere in the country. One date was identified 6 months in advance as the surgical screening clinic day. All potential surgical candidates were seen by a group of Honduran physicians 3 months in advance, and approximately 100 patients were selected to be evaluated by the visiting surgical team. Patients were selected based on severity of pathology, waiting time for treatment, and likelihood of improvement with surgery. Approximately 25 patients were not evaluated by the visiting team, but were added to a waiting list in the event of cancellations.

Implementation

On the preoperative clinic day, the host nation physicians with accompanying fellows, residents, and medical students assisted the visiting surgical team with medical interpretation and documentation. The surgical indications and decision-making processes were shared with the host nation physicians as well. Through the course of the mission, the host nation providers both assisted and observed the surgeries and were the primary caretakers of the patients for inpatient hospital care and disposition. They also participated in the postoperative clinic at the completion of the mission. Special emphasis was placed on communicating and documenting the postoperative plan so that patients could receive the appropriate occupational therapy postoperatively. Occupational therapists from the visiting team and the host nation worked together to implement and document these plans. Plans were made for communication between the physicians from both nations after mission completion in the event of questions regarding follow-on treatment.

During the preoperative clinic, the visiting MEDRETE team divided into two surgical teams and joined with the host nation medical team to see the prescreened patients. Patient interviews were conducted with interpreter assistance. Capabilities for radiographs and basic blood testing were available as needed. After completion of the clinic, patients were scheduled for surgery over the next 2 weeks. Surgeries were performed during the remainder of the mission in two operating rooms. Most patients were admitted the day before surgery. Morning rounds were conducted each morning because most postoperative patients were admitted overnight. The majority of patients were discharged the morning following surgery. Additional patients who presented during the course of the mission were seen and evaluated and added to the surgery schedule if time, space, and resources were available. All patients returned for postoperative visits either during the 2nd week or the last full day of the mission, which was saved as a postoperative clinic day. Dressing changes, splinting, and casting were performed as dictated by the postoperative plan. Occupational therapists assisted in these efforts and were available to provide each patient with a postoperative occupational therapy rehabilitation plan.

Results

A total of 99 prescreened patients were seen and evaluated on the first clinic day. Of these, 65 (65.7%) were indicated for surgery. An additional 23 presented during the course of the mission, often not prescreened, and two (8.7%) were added to the surgery schedule. Ten surgeries were canceled due to patient not returning for surgery,

TABLE 4 Procedures performed

Procedure	Number Performed
Primary flexor tendon repairs	14
Stage I flexor tendon repairs	6
Extensor tendon repairs	14
Tendon transfers	15
Nerve repairs	7
Digital fusion or pinning	23
Mass excision	6
Tendon release	6
Tendon fractional lengthening	5
Tendon centralization	4
Debridement and irrigation	4
Contracture release	4
ORIF or CRPP	4
Carpal tunnel release	4
Z-lengthening/plasty	4
Tenolysis	8
Hardware removal	3
Manipulation under anesthesia	5
Flap debulking/revision	2
Wrist arthrodesis	2
Foreign body removal	2
Tenodesis	2
Darrach ulna resection	1
Syndactyly release	1
Radial head excision	1
Phalangeal rotation osteotomy	1
Split-thickness skin graft	1
Volar plate augmentation	1
Zancolli lasso	1
Targeted reinnervation/Oberlin	1
Nerve transfer	1
Total	153

ORIF, open reduction and internal fixation; CRPP, closed reduction and percutaneous pinning.

and one patient required two operations. As a result, a total of 58 surgeries were performed. This was eight cases larger than the planned 50 cases. A full characterization of the procedures performed during the mission can be found in Table 4 and Figure 1. As cases were added to the schedule, the surgical and anesthesia teams believed they could safely adjust to any equipment shortfalls, rather than turn patients away. Of the patients who underwent surgery, four patients would require follow-on surgery based on the work that was done by the surgical team. Two underwent staged tendon reconstruction and therefore would require an additional surgery. Another patient continued to have a deep infection and would require a return to the operating room for further debridement and eventual closure. All operative patients returned for one postoperative visit.

Prior to arrival, there were several known equipment issues. The Army hospital that had lent surgical instrument trays in the past was unable to provide the requested eight hand and foot sets and instead provided five. Experience

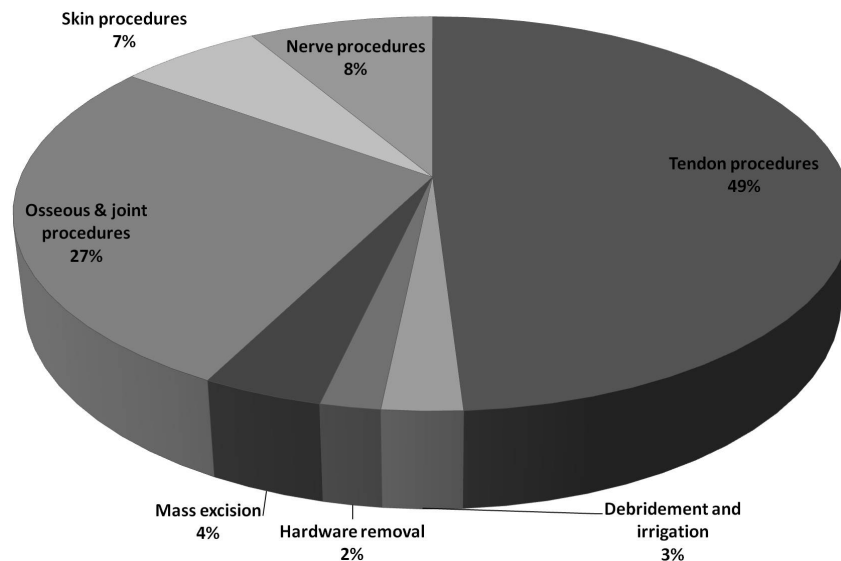


FIGURE 1 Characterization of procedures performed.

at the Honduras hospital suggested that sets could only be sterilized overnight, therefore limiting the surgical team to five cases between two rooms.

Upon the full team's arrival to Tegucigalpa, several marked deficiencies were noted regarding available supplies. Specifically, preoperative antibiotics and a key sedative (propofol) did not arrive. Seventy-five percent of the local anesthetics ordered did not arrive, providing a critical shortage for this mission which planned on emphasizing regional anesthesia. Additionally, 50% of the surgical drapes were missing.

Complications of all surgical procedures performed on the mission included loss of fixation of two proximal interphalangeal joint fusions requiring revision and a postoperative anterior interosseous nerve palsy after a tendon transfer, which began to improve by the initial postoperative visit.

Discussion

The diagnoses made during the initial evaluation were made without the benefit of many modern medical innovations, including axial imaging, electromyographic studies, and nerve conduction studies, or, in some cases, without radiographs. Obtaining these studies was limited not only by the host nation hospital's ability to perform them, but also the patient's ability to pay. While this certainly would not meet the standard of care in the United States, the surgical team made a case-by-case decision whether to continue with a procedure without the necessary workup, realizing that this mission may be the patient's only chance for a surgical intervention.

The lack of preoperative antibiotic and sedative arrival could have put the entire mission in jeopardy. Fortunately, the anesthesia team hand-carried an emergency supply of medications in case of a delayed shipment. There were enough antibiotics to cover the mission, as well as enough noncontrolled sedatives for 10 cases. By calculating an appropriate mixture of the three sedatives available, making use of the synergistic properties of these medications, and eliminating any waste by premixing the medications, the 10-case supply was able to be stretched to cover 40 cases. The surgical drape shortage was compensated by stretching the available orthopaedic drapes using gowns and sterile towels, and by using leftover cystoscopy drapes from a prior urology MEDRETE. Since only one general anesthesia surgery was planned, it was scheduled for the end of the mission to allow time for the shipment to arrive.

Projected shortfalls in other mission-critical items were identified and an express order was placed to make up the difference. Fortunately, by the end of the first week of operating, the originally ordered missing items arrived, including more local anesthetics, which allowed the mission to continue without disruption. The express order, which never arrived due to delays in customs, was canceled.

To circumvent the shortage of hand and foot surgical instrument sets, the surgical techs split the five sets into 10 in order to stretch the team's capabilities and brought more commonly needed instruments in individual sterile packs. This often required the surgical team to be more flexible and be willing to accept an imperfect substitute for the requested instrument. Similarly, limitations in the number of power tool sets available also required careful

scheduling of cases to avoid not having the required tools on any given day due to sterilization limitations.

Throughout the course of the mission as the supplies were utilized, shortfalls in some smaller items were identified. These shortfalls were due to differences between the anticipated and actual surgeries performed based on pathology encountered, surgeon preference for different items, and the increased caseload compared to the planned 50 cases. To adjust, some single-use items were used twice, such as tourniquets and electrocautery pads. Other items such as surgical internal fixation plates were stacked in order to achieve the required length or rigidity. A few other items were borrowed from the host nations, such as silicone tendon rods.

The additional number of cases scheduled also introduced a shortage of operating room time and space. Only two rooms were available for the majority of the time in country. This issue was mitigated by the fact that the Honduran Independence Day fell during the mission, and on that day there was no shortage of available operating rooms. Therefore, on that day, the team was split into three subgroups in three operating rooms, increasing productivity. To maintain standard of care for anesthesia (anesthesia staff present for all regional blocks while maintaining monitored anesthesia care on three simultaneous cases), the operating rooms were separated by a curtain and regional blocks were performed in the same room as an ongoing case, with the newly blocked patient then being transported to the third room for surgery.

Due to the working relationship established between the MEDRETE team and the host nation surgeons, efforts were made to ensure that any required follow-on surgery was within the capabilities of the local surgeons and could be accomplished in an appropriate time frame.

The JFT-B liaison physician and the visiting surgical team worked together to create a database of the patients operated on, pathology encountered intraoperatively, and procedures performed. This record included preoperative notes, brief operative notes, and preoperative, intraoperative, and postoperative digital photographs. Because of the annual nature of this mission and the relationships built over time between the physicians from both countries, this record provides a basis for communication between the surgical teams after mission completion. While there have been no formal plans made to monitor patient care or surgical outcomes, communication via e-mail certainly offers an opportunity to address questions or concerns on a postoperative patient. Future missions are planned in

hand surgery in following years, with some of the same team members planning to participate.

The opportunity to conduct surgical training in a developing country was an invaluable experience for the MEDRETE team members. The additional planning and cross-disciplinary cooperation required to make the mission a success is excellent preparation for deployment of surgical capabilities to a remote location or austere environment. The volume of severe orthopaedic hand pathology provided valuable surgical experience to the team as well.

A main focus of the mission was creating a partnership between the MEDRETE team and the host nation physicians. The patients are Honduran natives and are ultimately the responsibility of the Honduran physicians and surgeons. Efforts from outside nations to provide assistance are inherently transitory in nature. By fostering relationships between health care providers from both nations, continuity of care can be optimized for those patients undergoing surgery, maximizing benefit for both patients and physicians.

Conclusion

A multidisciplinary and multination concerted effort is required for a successful humanitarian medical mission. A premission plan is critical prior to arrival, the surgical team must be flexible and adapt to a myriad of potential scenarios, and a contingency plan must be in place for missing mission-critical items. A well-planned humanitarian medical mission can be extremely rewarding for both the patient and surgeon.

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