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CHALLENGES IN IMPLEMENTING INTERNATIONAL STANDARDS FOR THE FIELD HOSPITAL EMERGENCY DEPARTMENT IN A DISASTER ZONE: THE ISRAELI EXPERIENCE

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☐ **Abstract—Background: Medical response to world disasters has too often been poorly coordinated and nonprofessional. To improve this, several agencies, led by the World Health Organization (WHO), have developed guidelines to provide accreditation for Foreign Medical Teams (FMTs). There are three levels, with the highest known as FMT Type-3 providing outpatient as well as inpatient surgical emergency care in addition to inpatient referral care. In November 2016, the WHO certified the Israel Defense Forces Field Hospital as the first FMT Type-3. Objectives: The objectives of this article are to describe the challenges in implementing these international standards for the field hospital emergency department in a disaster zone. Discussion: There are general standards for all levels of FMTs, as well as specific requirements for the FMT-3. These include a mechanism of appropriate triage, two operating suites, 40 regular beds, four to six intensive care unit beds, radiology facilities, and various staff specialties. Despite the sophistication of the field hospital, there are many challenges. Logistical challenges include constructing the hospital in a disaster zone and equipment issues. There are staff challenges such as becoming oriented to a new and difficult environment. Patient challenges include cultural differences, language barriers, and issues of follow-up. There are often ethical challenges unique to the disaster zone. Conclusion: By presenting the experience and challenges of the first FMT Type-3, we hope that more countries can join this initiative and improve disaster care throughout the world.**

☐ **Keywords—disasters; World Health Organization; mobile health units; accreditation; hospitals**

INTRODUCTION

Medical response to world disasters has too often been poorly coordinated and nonprofessional (1–3). To improve this situation, several agencies, led by the World Health Organization (WHO), have developed guidelines to provide accreditation for Foreign Medical Teams (FMTs). There are three recognized levels of FMTs based on their ability to provide increasingly complex care as well as to treat increasing numbers of patients. FMT Type-1 provides outpatient emergency care, Type-2 delivers inpatient surgical emergency care, and the highest level, Type-3, adds inpatient referral care. In November 2016, after a rigorous verification process, the WHO certified the Israel Defense Forces Field

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Hospital (IDF-FH) as the first internationally recognized FMT Type-3.

The IDF has a rich history of sending humanitarian delegations to disaster zones. The first was dispatched to Greece in 1953 in response to an earthquake. This was a mobile clinic and it was not until 1988 that a proper field hospital was deployed in response to an earthquake in Armenia (4). Most recently, the IDF-FH deployed to the Haiti earthquake disaster in 2010, the Philippines in response to Typhoon Yolanda in 2013, and the earthquake in Nepal in 2015 (5–7). During the latest deployment to Nepal in April 2015 over 11 days, a total of 1668 patients were treated by the team (mean of 151.6 patients per day). Of these, 450 were ages 0 through 18 years (27%), with 87 being 2 years of age or younger (5.2%).

There are challenges in adhering to recognized standards of emergency department (ED) care at home—even more so in the disaster setting. The purpose of this article is to describe the challenges in implementing the WHO standards in the ED of the IDF-FH to serve as a paradigm for other FMTs.

DISCUSSION

WHO Standards for FMTs

There are general standards that all levels of FMTs are required to adhere to: maintaining confidential patient records, licensing of staff in their home countries, and the need for malpractice insurance. All pharmaceuticals and equipment must conform to international guidelines. Hygienic, sanitation, and medical waste standards must be maintained. Self-sufficiency is expected.

For the Type-3 field hospital there must be a mechanism of triage, resuscitation, advanced airway management, reconstructive care, intensive care, and rehabilitation. There must be radiology facilities and ultrasound capabilities. Table 1 summarizes the medical requirements of an FMT Type-3 facility (8).

Table 1. FMT Type-3 Requirements According to the World Health Organization

Services	Characteristics
Surgical care requirements	Complex wound and orthopedic
Operating suites	2
Operating room activity	15 major or 30 minor procedures daily
Inpatient beds (ICU/regular)	4–6/40
Staff specialties	Emergency medicine, internal medicine, surgery, orthopedics, plastic surgery, rehabilitative medicine, pediatrics, and anesthesia
Additional staff	Nursing and logistics
Advanced specialties (optional)	Oral maxillofacial surgery, ortho-plastic reconstruction, maternal health
Additional advanced services	X-ray, sterilization, blood transfusion, laboratory

FMT = Foreign Medical Team; ICU = intensive care unit.

Design and Implementation

Registration and triage. The field hospital is intended to operate as a stand-alone facility, although it can work fully integrated with a local hospital such as took place after Typhoon Yolanda in the Philippines. The ED was located on the grounds of a district hospital in the city of Bogo, while the rest of the IDF team joined with the local staff to offer inpatient and surgical services in the hospital itself (6).

Registration and triage are performed in a tent at the entrance of the IDF-FH unless the patient needs emergent care. Triage is an informal three-level system: emergent, urgent, or nonurgent. Emergent patients are those in need of resuscitation, immediate airway management, or are hemodynamically unstable. They are taken immediately to the resuscitation area and are registered at the bedside.

Patients are registered by being assigned a unique identification number placed on a wrist bracelet, which is used throughout their hospital stay. A frontal picture of the face is taken, which is automatically uploaded into the electronic medical record (EMR). Vital signs are then taken in a designated triage area. Patients in need of urgent care can be routed to a medical/surgical bed. This includes those with severe injuries or significant medical problems but who are hemodynamically stable. Nonurgent patients can be examined either on a bed or sitting. Registration and triage use a unique medical informatics system designed specifically by the IDF-FH known as HAITI, as it was first used during the earthquake in that country in 2010 (9).

Electronic medical record. When a patient enters any department in the hospital, a scan of the barcode on the bracelet updates their location. All information is entered into the HAITI EMR, including orders, history and physical examination, laboratory work, procedure notes, imaging results, operating reports, and medical decision-making. The platform is accessed using laptops or tablets. All current patients in the ED, as well as their waiting times, can be viewed on individual computers or a central large screen, which enables monitoring of flow. The system is integrated with the Picture Archiving and Communication System and available on all computers. The EMR enables the patient to be discharged with an English version of their medical record and printed copies of their radiographs.

General Emergency Department. The ED is based on the Anglo-American model of emergency medicine and includes patients of all ages and conditions. The design is

modular and consists of two tents, each with up to 10 beds, in addition to a sitting area. These have been set up in one of three ways: 1) two tents for a mix of all patients, 2) one tent for critical patients and one for urgent care patients, and 3) one tent for adult patients and a separate one for pediatrics.

Within the ED there is at least one resuscitation zone where critically ill patients can be stabilized using advanced medical equipment. Rapid sequence intubation can be performed using standard medications including ketamine, midazolam, propofol, etomidate, and succinylcholine. Ventilators, cardiac monitoring, and central lines are available. Vasopressors, dried plasma, and packed red blood cells can be given. Blood work including a complete blood count, chemistry, urine tests, and cultures can be sent to the laboratory.

Point-of-care ultrasound. Point-of-care ultrasound can be performed based on the guidelines of the American College of Emergency Physicians such that there is minimal reason to bring x-ray equipment into the ED (10). Linear, curvilinear, and phased-array probes are available to perform lung, cardiac, and abdominal ultrasound examinations. Ultrasound-guided procedures can be performed.

Procedural sedation and analgesia. Equipment for performing procedural sedation and analgesia (PSA) is based on internationally accepted standards (11). This includes pulse oximetry, suction, capnography, and supplemental oxygen. PSA is provided by a certified physician and a nurse assistant who is also certified in Advanced Cardiac Life Support or Pediatric Advanced Life Support. Propofol, ketamine, midazolam, and fentanyl are available.

In Nepal after the major earthquake in 2015, pediatric emergency medicine specialists performed 10 cases of PSA, using ketamine in eight cases. PSA was used for wound debridement, fracture reduction, and laceration repair. There were two cases involving reversible serious adverse events during sedation. Neither patient required intubation or admission to the intensive care unit (12).

Personnel. Patients are treated by a team that includes physicians, nurses, and emergency medical technicians (EMTs). The medical director, who is always a senior emergency physician, oversees the medical care within the department. Depending on the case mix of patients and the design, there may be a parallel director of the pediatric ED. Both directors have patient responsibility.

The staff physicians are responsible for the medical care of their patients as well as performing procedures. As all physicians in Israel undergo a rotating internship, consultants such as Ophthalmology and Neurology often work as primary physicians in the ED for lower-acuity patients when they are not busy.

The nursing director oversees the staff nurses and EMTs and is responsible for managing the flow of the patients through the ED. There is an additional responsibility of handing over patient information to the accepting departments. Staff nurses are responsible for ensuring appropriate dispensing of medication as well as for accurate nursing documentation. All are certified in emergency nursing.

Working along with the directors are logistical administrators who are in charge of receiving and transporting patients. In addition, they are responsible for ordering the medical equipment, communicating with the other departments, and arranging for additional staffing.

The EMTs perform procedures within their scope of practice including bag-valve-mask ventilation, intravenous line insertion, application of bandages and tourniquets, and dispensing medications. They are also responsible for accompanying critically ill patients during interdepartmental transfers and assisting the physicians as needed. In addition, there is at least one EMT who serves as a scribe.

A unique addition to the IDF-FH are medical clowns (MCs). The use of MCs for alleviating pain and distress (in pediatric as well as adult patients) has been in practice for close to 30 years in hospitals throughout the world. MCs in Israel undergo a formal recognized training program. Five medical clowns joined the team for the response to the earthquake in Nepal in 2015 and were accepted favorably by the group. This is thought to be the first known use of medical clowns in a disaster zone (13).

Disposition of patients. After initial diagnosis and stabilization, the goal is to quickly disposition patients to either the intensive care unit, medical/surgical ward, operating room, or discharge. If admitted, the patient is then transported on a stretcher to the appropriate department, with their EMR updated accordingly. As they enter the next department, their ID bracelet is scanned, enabling them to appear on the computer as a patient in that department. Disposition is always one way, and once the patient is admitted they do not return to the ED.

Challenges

Staff challenges. Emergency medicine in Israel is a relatively new specialty, having first been recognized in 1999. A workforce study of emergency physicians in Israel in 2012 revealed only 164 board-certified general emergency physicians. That same year the Scientific Council of the Israeli Medical Association recognized EM as a primary specialty (14). Hence, some of the physicians in the ED of the IDF-FH are not board-certified emergency physicians. They include family physicians, and general and orthopedic surgeons. The IDF is

currently taking steps to recruit and integrate general emergency and pediatric emergency physicians into the unit.

Organizing the shifts without a clear prediction of number of visits presents a challenge. In the disaster zone—like in every ED worldwide—one should be prepared to work 24/7. However, fewer patients arrive at night, as transportation becomes much more difficult after dark. To solve this, most shifts were scheduled during the day and evening (from 7:00 AM–10:00 PM) with a night on-call schedule. Surges in patient volume were effectively addressed in several ways. Specialists who were not busy were recruited to see lower-acuity patients. In addition, if there were more adult patients than pediatric patients, then the pediatric emergency physicians would evaluate older patients with straightforward medical problems or injuries. General emergency physicians or general pediatricians would help out if there was a surge of pediatric patients. Lastly, many people come with chronic problems not related to the disaster itself. If nonemergent, they would patiently wait in the triage area.

The team itself is not organic, as the members work at different hospitals. Although this is advantageous to Israel, as an entire ED is not drained of its staff, it presents challenges as members from different institutions with diverse practices and protocols are suddenly placed in an extremely intense environment. To improve team building, yearly drills take place for 1–2 weeks where the group can train together. In addition to updating clinical knowledge and brushing up on procedures, these exercises emphasize crisis resource management and solve any perceived hierarchical issues. The time prior to arrival to the actual disaster, both in the airport and on the plane, is effectively used for the coordination of the team and logistical planning.

Although many specialty surgeons such as Plastics, Otolaryngology, and Oral Surgery are available by definition of the hospital being FMT Type-3, there are still some specialists not present. For example, there is no pediatric cardiologist, and a child with symptoms of dyspnea and an abnormal echocardiogram on bedside ultrasound might need specialty consultation. Telemedicine has helped to effectively resolve this issue using applications such as WhatsApp (WhatsApp Inc., Menlo Park, CA); videos have been sent to specialists in Israel who have provided lifesaving advice.

Being in a disaster zone itself exposes staff members to personal risk. Of respondents to a survey after the mission to Nepal in 2015, 64% complained of medical symptoms, mostly gastrointestinal complaints (15). Burnout and stress are a known issue in health care workers who respond to multi-casualty incidents (MCIs) (16–18). Studies show that those who developed posttraumatic stress disorder symptoms were more likely to have been injured, been disconnected from family and friends, and have passive coping styles and neurotic personalities. Stressors may be psychological, from witnessing death on a large scale, the intensity of the work, and leaving family and loved ones behind. A rapid triage tool was recently developed to identify those at high risk for posttraumatic stress disorder, although it has yet to be implemented by the IDF team (19).

Practical solutions are implemented to decrease stress among the staff. As soon as possible, direct satellite phone hookups to Israel are assembled so that the staff can call family. A separate small tent with refreshments is established. Debriefings among the teams as well as among the directors are carried out on a daily basis. A professional mental health worker and psychiatrist are always present on any humanitarian mission. The MCs, in addition to their effect on the patients, are there to also help the staff. Usually toward the end of any mission, several hours are set aside to take the team on a respite away from the hospital.

Pediatric challenges. The adage "children are not just little adults" obviously also applies to the disaster zone. Children, especially those under the age of 5 years, are particularly vulnerable in a disaster. They are more likely to be injured, lost, unable to access help or health care, or exposed to greater danger through separation from their families or caregivers. In most disasters, between a third and a half of the dead are children (20). A child's response to disaster can have long-term effects on future behavior as well as function. The general medical staff treating the pediatric population are not usually accustomed to the size and weight consideration needed for drug dosing. Knowledge of the types of presentations in a disaster zone is paramount so that proper preparation can take place. For example, in Haiti, most pediatric injuries were orthopedic, including open fractures and crush injuries. The majority of medical problems were related to infectious diseases, particularly gastrointestinal, although skin and respiratory were also prevalent (21).

Having designated pediatric emergency physicians and nurses who are proficient in both the medical and emotional aspects of child care makes a significant difference both in terms of being more comfortable treating the hemodynamically unstable trauma patient, and being facile with PSA for procedures in the more stable patient.

Separate equipment and often medications need to be brought along. This includes a resuscitation cart with appropriate-sized endotracheal tubes, bag-valve masks, intravenous lines, and defibrillator pads, along with medications in the form of syrup and suppositories. Diapers and formula need to be stocked. And of course, it is

important not to forget the little items such as bubbles and stickers that can be used as distractions.

Patient challenges. Cultural issues are a challenge. First, there is the language barrier. There are the nuances and subtleties of a translation through a third party, which is usually between the native language and English. Body language itself may be interpreted differently in various cultures. Although the discharge instructions are written in English, sometimes no one in the family or community understand English. In Nepal this was solved by drawing culturally accepted symbols representing the number of times a day that the medication needs to be taken.

Personal finances might also become an issue. For example, if a patient presents for essential hypertension and receives a week's supply of medication, the patient may not be able to continue the medication long term. Another example is that of patients who were discovered in atrial fibrillation but couldn't pay for coumadin or monitor the international normalized ratio after discharge. These patients were sent home with the understanding that long-term treatment was the intended plan. (It should be noted that the IDF never bills patients).

There is also the issue of continuity of care. For example, patients who underwent orthopedic surgery were discharged with instructions to have the cast or stitches removed, although it was unclear where this would take place. This challenge has yet to be fully solved.

Logistical challenges. Providing a clean work environment and sterile equipment, along with patient privacy in a disaster zone, can be a major challenge. Figure 1 depicts the ED of the IDF-FH in Nepal after the devastating earthquake in 2015. This is taken immediately before any patients entered, but clearly depicts separate treatment areas, gloves, alcohol-based hand wash, needle disposal containers, waste baskets, and stretchers covered by removable paper.

Figure 1. Emergency Department of the IDF Field Hospital in Nepal, 2015.

Equipment itself is a major issue. In the Haiti earthquake disaster, crush injuries resulting in renal failure were treated conservatively, although dialysis is the standard of care (22). Dialysis machines have yet to be purchased for the FH. There is also a need to acquire rarely used, but essential equipment, such as a video laryngoscope. There is a need to upgrade the ultrasound machines, monitors, and ventilators. A major grant was given to the IDF-FH and efforts are currently underway to purchase this equipment. In addition, a computed tomography machine, although available for field hospitals, has not actually been implemented (23).

Although the informatics system allows continuity of patient care throughout hospitalization, a new random identification (ID) number needs to be assigned should the patient return. This is out of necessity, as in developing countries in a disaster situation, patients often don't have or don't remember their ID number given at birth. A patient who comes multiple times will have a different ID number each time. Unless the patient actually brings a copy of his medical record each time, then tracking return visits and continuity of care may be difficult. A solution to this problem has yet to be implemented.

Ethical challenges. By definition, the FMT-3 arrives early in a disaster. This means that they confront a situation in which there is a massive influx of patients with minimal possibilities in the community for follow-up. One of the most pressing and emotional challenges for the staff at this point involves who will begin to receive care in the disaster setting as opposed to the prioritization of care. This obviously depends on the extent of the disaster.

In Haiti in 2010, when a devastating earthquake was responsible for 300,000 injured, in addition to more than 200,000 deaths, this became an immediate challenge (24). It was decided in this situation to create a pretriage area where there would be one decision—whether or not to begin to treat the patient. This was based on two criteria: the patient's clinical condition and whether the resources were available (25). In many disaster situations, where injuries outweigh resources, patients who would normally be treated in an advanced Western health care facility would, unfortunately, not be treated in the FH. This could include patients with severe head injuries, as there is no available computed tomography scanner and no neurosurgeon. It may also include someone with a severe chest, abdominal, or crush injury who is hemodynamically unstable and has little chance of survival.

Patients often were discharged early from the IDF-FH due to full capacity, whereas in Israel itself they would either be kept in the hospital or transferred to an accepting facility. This includes many orthopedic surgery patients who were discharged within 24 h. Other patients with exacerbations of chronic disease were

discharged early, whereas in Israel the standard would be to either transfer them to a rehabilitation facility or arrange for home oxygen.

CONCLUSION

The WHO has done a tremendous job in terms of setting the standards for field hospitals. Maintaining these standards is a constant challenge. It is hoped that by presenting the challenges of Israel's field hospital—the first to receive FMT-3 designation—this will enable more countries to reach this level and improve disaster care throughout the world.

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