

Extending a Helping Hand: A Comparison of Israel Defense Forces Medical Corps Humanitarian Aid Field Hospitals

Yuval Glick MD¹, Erez N. Baruch MD¹, Avishai M. Tsur MD¹, Amy L. Berg MD¹, Dror Yifrah MBA MHA¹, Avraham Yitzhak MD¹, David Dagan MD MHA¹ and Tarif Bader MD MHA^{1,2}

¹Israel Defense Forces Medical Corps, Ramat Gan, Israel

²Department of Military Medicine, The Hebrew University, Jerusalem, Israel

ABSTRACT: **Background:** During the past 6 years the Israel Defense Forces Medical Corps (IDF-MC) deployed three humanitarian delegation field hospitals (HDFHs) in disaster zones around the globe: Haiti (2010), the Philippines (2013), and Nepal (2015). **Objectives:** To compare the activity of these HDFHs and the characteristics of the patients they served. **Methods:** This retrospective study was based on the HDFHs' operation logs and patients medical records. The study population included both the staff who participated and the patients who were treated in any of the three HDFHs. **Results:** The Philippine HDFH was a "hybrid" type, i.e., it was integrated with a local hospital. Both the Haitian and the Nepali HDFHs were the "stand-alone" type, i.e., were completely autonomic in resources and in function. The Nepali HDFH had a larger staff, departed from Israel 4 hours earlier and was active 7 hours earlier as compared to the Haitian one. In total, 5465 patients, 55% of them female, were treated in the three HDFHs. In Haiti, Nepal and the Philippines, disaster-related injuries accounted for 66%, 26% and 2% of the cases, respectively. Disaster-related injuries presented mainly in the first days of the HDFHs' activity. **Conclusions:** The next HDFH should be planned to care for a significant proportion of routine medical illnesses. The IDF-MC continuous learning process will enable future HDFHs to save more lives as we "extend a helping hand" to foreign populations in crisis.

IMAJ 2016; 18: 581-585

KEY WORDS: humanitarian delegation field hospitals (HDFHs), mobile health unit, disaster medicine, international cooperation

Between 1994 and 2013, natural disasters claimed the lives of over 1.35 million people and adversely affected 218 million others [1]. During those years, earthquakes were the third most frequent natural disaster, constituting 3% of the total. However, earthquakes caused 55% of the natural disaster-related deaths (750,000 people), making them the deadliest of all natural disas-

ters. Storms are the second most frequent natural disaster and second most deadly, responsible for the death of over 244,000 people during the past 20 years. Three of the most prominent natural disasters in the last decade were the earthquakes in Haiti and Nepal (2010 and 2015, respectively), and the Yolanda typhoon storm in the Philippines (2013). On 12 January 2010, a 7.0 Richter scale earthquake struck Haiti, causing the death of 100,000–300,000 people and injuring 300,000 others [2,3]. On 25 April 2015, Nepal was hit by a 7.8 Richter scale earthquake, resulting in the death of 8964 people and the injury of 21,952 others [4]. On 8 November 2013, the Philippines were struck by the deadliest typhoon storm ever recorded in its history [5], typhoon Yolanda. The storm killed more than 6300 people, injured 28,866 and affected the lives of 25 million people. According to the World Health Organization (WHO), natural disasters cause massive amounts of casualties, often overwhelming the local health system. Moreover, these disasters usually directly damage the local health system's infrastructure, diminishing the nation's ability to provide proper emergency medical care. As a result, medical care to victims in severe natural disasters is often provided by foreign civilian or military field hospitals [6].

The Israel Defense Forces (IDF) dispatched its first humanitarian delegation to a disaster zone in 1953. As detailed in Table 1, between 1950 and 1980 the IDF's medical care in humanitarian delegations was limited to a mobile clinic staffed by a few physicians and medics. In 1988, after a 6.8 magnitude earthquake in Armenia, the Israel Defense Forces Medical Corps (IDF-MC) dispatched a full-scale Humanitarian Delegation Field Hospital (HDFH) for the first time. In the following years, the IDF-MC dispatched nine additional HDFHs. Apart from Rwanda, Kosovo and Syria, all HDFHs were dispatched to natural disaster zones. Previous studies of IDF-MC HDFHs assessed their features in a single setting, or compared a specific aspect of patient care (e.g., orthopedic, obstetric) between disasters [7-11], but no systematic comparison of different IDF-MC HDFHs has been reported. As HDFH delegations are becoming more and more frequent, analyzing the HDFHs' activity, in terms of capacities and yield, and comparing the patients'

Table 1. History of the IDF-MC humanitarian delegations

Destination	Year	Type of disaster	Content of delegation
Greece	1953	Earthquake	Mobile clinic
Macedonia	1963	Earthquake	Mobile clinic
Cambodia	1979	War, Cambodian refugees	Medical staff was sent to the Red Cross hospital for Cambodian refugees
Mexico	1985	Earthquake	Mobile clinic
Cameroon	1986	Volcanic eruption	Mobile clinic
Armenia	1988	Earthquake	HDFH
Rwanda	1994	War, Rwandan refugees	HDFH
Kosovo	1999	War, Albanian refugees	HDFH
Adapzari, Turkey	1999	Earthquake	HDFH
Duzce, Turkey	1999	Earthquake	HDFH
India	2001	Earthquake	HDFH
Haiti	2010	Earthquake	HDFH
Japan	2011	Earthquake	Mobile clinic
Syria	2013	War, Syrian refugees	HDFH
The Philippines	2013	Storm	HDFH
Nepal	2015	Earthquake	HDFH

diagnoses and characteristics will help in planing future missions more appropriately. Therefore, the aim of this study was to compare the HDFH activity and patient characteristics of three recent IDF-MC HDFHs: in Haiti (2010), the Philippines (2013), and Nepal (2015).

PATIENTS AND METHODS

HUMANITARIAN DELEGATION FIELD HOSPITAL

The HDFH is an IDF-MC relief system designed to provide medical care to a foreign population beyond Israel's borders. The WHO defines such a field hospital system as "a mobile, self-contained, self-sufficient health care facility capable of rapid deployment and expansion or contraction to meet emergency requirements for a specified period of time" [6]. HDFHs can be used in disaster zones for three different purposes: (i) providing emergency life-saving medical care, (ii) supplying routine medical health care, and (iii) serving as a substitute for medical facilities being repaired or reconstructed. The IDF-MC is capable of deploying two different types of HDFHs.

The first type is the "stand-alone" HDFH which is self-sufficient in terms of resources (staff, fuel, food, electrical power, medical equipment) and capabilities (deployment, operation, security). Medical equipment for this HDFH type includes: ventilators, monitors, defibrillators, oxygen supply, fully stocked pharmacies, imaging apparatus, and laboratories capable of conducting blood tests, including chemistry, complete blood count and blood gases, as well as urine tests and microbiol-

ogy analyses. It can provide medical services of a type III field medical facility [12]: an emergency department, intensive care, inpatient wards, delivery rooms and operating rooms. Since the "stand-alone" HDFH is completely autonomous the HDFH team is solely responsible for all decisions related to patient care.

The second HDFH type is the "hybrid." The hybrid HDFH has the ability to function autonomously as well as integrate with a local medical facility. Such integration creates synergy between the two systems, allowing the whole to be greater than the sum of its parts. Several benefits of such integration are: utilizing the HDFH imaging and laboratory services when local services are unavailable due to damaged electrical power supply, triaging a greater number of patients using staff from both the HDFH and local hospitals, and increasing inpatient bed capacity. Integration of the hybrid HDFH with a local hospital promotes better and faster treatment for more patients.

According to the Israeli government directive, the IDF-MC must maintain constant readiness to deploy a HDFH anywhere in the world [7]. Once the Israeli government decides to dispatch a HDFH, the following actions occur. Initially, an early assessment team is dispatched to the disaster zone as soon as possible to evaluate the severity of the disaster, assess the medical needs and find a proper area for the deployment of the HDFH. Based on the assessment team's feedback to the delegation commander, the suitable HDFH equipment and supplies are prepared for departure and the HDFH staff is recruited. HDFH staff is based on both reserve and active service participants from different disciplines and specialties, such as surgeons, internists, nurses, paramedical staff, medics, logistic staff and medical command officers. In order to learn from the experience of previous HDFHs, the proportion of new participants to those who have already taken part in past missions is kept in a constant 1:2 ratio [unpublished data].

STUDY DESIGN AND POPULATION

This retrospective descriptive study was approved by the IDF-MC institutional review board and was conducted in accordance with the Good Clinical Practice guidelines. Three HDFHs in three different IDF-MC HDFHs were reviewed in this study: in Haiti (2010), the Philippines (2013), and Nepal (2015).

This study included two populations. The first was the HDFHs' staff. This population included all medical, paramedical, logistic and medical command personnel who participated in any of the three mentioned HDFHs. The paramedical staff comprised medical engineers, pharmacists, radiology technicians, laboratory technicians, social workers, medical informatics specialists and public health practitioners. The second study population comprised the HDFH patients. This population included all patients who attended any of the three HDFHs mentioned above and received any kind of medical treatment.

Data concerning the staff, patient characteristics and activity parameters of the HDFHs such as deployment time, bed capac-

ity, length of stay and number of procedures were obtained from both patients' medical records and from the HDFH's operation logs. Data were analyzed using Microsoft Excel (version 2010, Microsoft Corporation, Redmond, WA, USA).

RESULTS

HDFHS DEPARTURE AND DEPLOYMENT

The Philippine HDFH was a "hybrid" type. For reasons unrelated to the IDF-MC, the order to dispatch a HDFH to the Philippines was given almost 2 days after the disaster. The Philippines HDFH arrived at the disaster area 5 days after the storm and was deployed in the city of Bogo. The time from the beginning of the deployment process to full activity was approximately 6 hours. Timeframe comparisons were not made with the other two HDFHs due to the relatively late order to dispatch the Philippine HDFH.

Both the Nepali and the Haitian HDFHs were the "stand-alone" type. The timeframes for the preparation and arrangement of these HDFHs are illustrated in Figure 1. The Nepali HDFH team departure time was 4 hours shorter than the Haitian one. The Haitian HDFH was deployed in a soccer field near Port-au-Prince airport. The Nepali HDFH was situated near the local Birenda Military Hospital in Kathmandu. The Nepali HDFH was available for patient admissions 7 hours earlier than the Haitian HDFH, although the cargo airplanes of both delegations landed 69 hours after the earthquakes.

HDFHS ACTIVITY

The hybrid Philippine HDFH was integrated into the Sevaro Veralló Memorial District Hospital in the city of Bogo. After integration of the Israeli HDFH, the local hospital's corridors were converted to inpatient wards, allowing the local hospital capacity to increase from 50 inpatient beds to 100. Patients underwent triage at the HDFH. Those who required hospitalization were first stabilized in the HDFH and then admitted to the local medical center with the liaison of a local physician. The responsibility for the admitted patients was local, with Israeli assistance. Surgeries were performed at the local medical center by surgeons from both teams. Outpatient care was administered solely by the HDFH team. Laboratory, imaging and pharmacy services, for both inpatients and outpatients, were conducted by the HDFH team. The Philippine HDFH was active for 11 days.

Both of the "stand-alone" HDFHs in Haiti and Nepal were organized in a similar structure and included the following divisions: medical, surgical, orthopedic, pediatric, gynecologic, ambulatory care and auxiliary services. The Haitian HDFH contained 58 beds and the Nepali 34. The Haitian and Nepali HDFHs were active for 11 and 10 days, respectively.

The HDFH staff in the stand-alone hospitals in Haiti and Nepal was similar in size. However, the hybrid Philippine HDFH staff was about half the size (121, 126 and 64 people

Figure 1. Timeline from disaster to deployment: Nepali and Haitian HDFHs

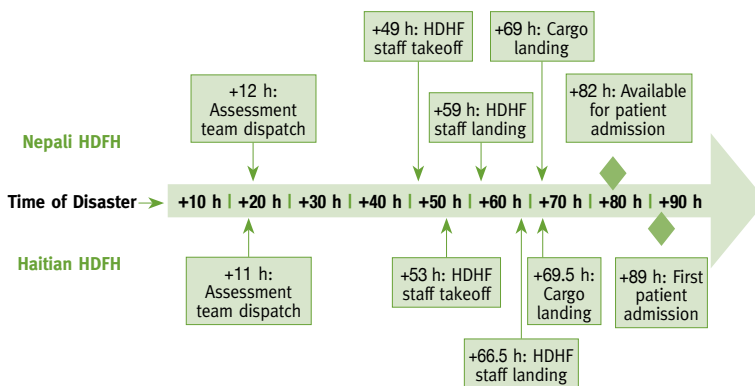


Table 2. Patients' characteristics and key functional parameters

	Haiti	Nepal	Philippines
No. of patients	1111	1668	2686
Males	459 (44%)	766 (46.7%)	1069 (40.3%)
Females	582 (56%)	864 (52.7%)	1582 (59.6%)
Missing Gender (% from total)	70 (6.3%)	30 (1.7%)	35 (1.3%)
Age (years)			
0-2	112 (11.4%)	30 (1.8%)	187 (7.1%)
3-18	251 (25.5%)	420 (25.4%)	653 (24.8%)
19-50	574 (58.4%)	947 (57.4%)	1319 (50.2%)
Above 50	46 (4.7%)	251 (15.2%)	470 (17.8%)
Missing age (% from total)	128 (11.5%)	20 (1.2%)	57 (2.1%)
Deliveries*	16	8	69
LOS of patients**			
Median LOS	16 hrs	1.4 hrs	
Mean LOS	29.7 hrs	5.65 hrs	
No. of patients who stayed less than 24 hrs	620 (65%)	1035 (95%)	

*Cesarean sections were counted as deliveries

**LOS data were available only in Haiti and Nepal since patient care of hospitalized patients, including discharge, was not conducted or documented by the Israeli team.

Missing data: Haiti 160 (14%) patients, Nepal 579 (35%) patients

in the Haitian, the Nepali and the Philippines HDFH respectively). The major staff reduction in the Philippine HDFH was of medical personnel. This reduction was carried out according to the recommendations of the early assessment team in accordance to local needs. Paramedical, logistics, and command staff remained constant in order to allow for proper HDFH function.

PATIENTS

Table 2 presents the characteristics of the HDFH patients. In all three HDFHs, female patients constituted a greater proportion than males. Additionally, pediatric patients (age < 18 years) accounted for more than a quarter of the patients. Since patient care was not administered solely by the Israeli HDFH

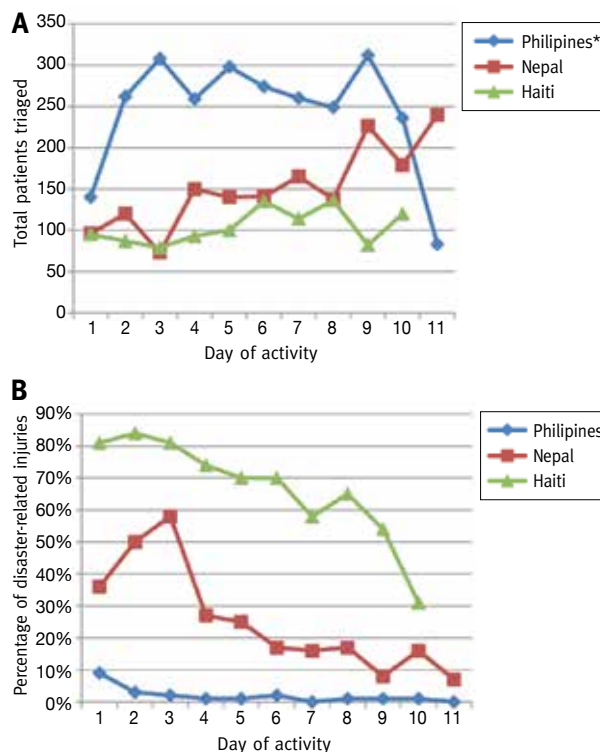
team in the hybrid HDFH, comparison regarding the length of stay (LOS) of patients was conducted only between the stand-alone HDFHs. In these Haitian and Nepali HDFHs, 65% and 95% of patients stayed less than 24 hours, respectively. The median LOS in the Haitian HDFH was 16 hours compared to only 1.4 hours in the Nepali HDFH.

Disaster-related injuries were the five most frequent diagnoses in Haiti, especially crush injuries and limb fractures. However, the five most frequent diagnoses in Nepal and the Philippines were routine medical illnesses that were not directly associated with the disaster, such as cough, abdominal pain, rash and acute upper respiratory infection. Overall, in the Haitian, Nepali and Philippine HDFHs, disaster-related injuries accounted for 66%, 26% and 2% of the cases treated, respectively. In all three HDFHs, the influx of total patients remained relatively stable over the course of time [Figure 2A]. However, disaster-related injuries accounted for a greater proportion of the total cases in the first days of the HDFHs' activity [Figure 2B]. For example, in the first 3 days of activity of the Haitian HDFH, approximately 80% of the patients had disaster-related injuries. By the 10th day of activity, such injuries accounted for only 30% of the cases.

DISCUSSION

This study demonstrated that a large proportion of patients treated in HDFHs had routine medical complaints and illnesses and not disaster-related injuries. Routine medical illnesses constituted 44%, 74% and 98% of the cases in Haiti, Nepal and the Philippines, respectively. The proportion of routine medical illnesses among patients increased steadily and rapidly as the duration of HDFH activity progressed. Our findings are similar to those of others who reported humanitarian medical activity. Malish et al. [13] described the activity of the United States Military Mobile Surgical Team Field Hospital which was deployed following the 2007 earthquake in Peru. Although this U.S. field hospital was deployed in Peru 48 hours after the earthquake, its team did not perform any earthquake-related life-saving surgeries. In addition, the number of patients with routine medical illnesses was 100 times greater than the number of surgical patients. The 1999 IDF-MC HDFH in Turkey was deployed approximately 72 hours after the earthquake, yet most patients (73%) had routine medical illnesses and were mostly treated in the internal medicine, pediatric and OB/GYN wards [14]. Von Schreeb et al. [15] reviewed 43 field hospitals in 4 different recent natural disasters: the earthquake in Bam, Iran (2003); the cyclone in Guanevaca, Haiti (2004); the earthquake in Indonesia (2004); and the earthquake in Pakistan (2005). Von Schreeb reported that within days following the disaster, the main efforts of medical care returned to focus on routine medical illnesses. Lastly, The WHO guidelines and different expert opinions suggest that life-saving treatments for disaster-related injuries may extend for

Figure 2. Influx of patients and distribution of disaster-related injuries over time: **[A]** demonstrates the total influx of patients to the HDFHs over time. The influx of total patients remained relatively stable over the course of time. **[B]** demonstrates the change in disaster-related trauma injuries over time



*The Philippine HDFH was active for half a day on days 1 and 11

the first 24–48 hours after the event. Later on, most efforts should be made to provide maintenance care for trauma patients and help the overwhelmed local health care system deal with routine emergencies and medical illnesses [6,16].

In this study, we demonstrated a relatively higher proportion of disaster-related injuries in the Haitian HDFH compared to the Nepali and the Philippine HDFHs. Such discrepancy can be attributed to the destructiveness of the Haitian earthquake. First, this disaster was extremely lethal, causing markedly higher casualty rates (approximately 100,000–300,000 dead in Haiti compared to 8964 in Nepal and 6300 in the Philippines) [3–5]. Secondly, the local Haitian medical infrastructure, as was the case for all other national infrastructures, was mostly destroyed, thus no emergency medical care could be provided to the injured until the arrival of foreign HDFHs [2,17,18]. Yet, even in such an extreme disaster, the proportion of routine medical illnesses was not substantially lower than that of disaster-related injuries (44% versus 66%, respectively). Moreover, reports from the Belgian First Aid and Support Team field hospital in the 2010 Haiti earthquake demonstrated that within 2 weeks after the earthquake, respiratory, digestive and ophthalmologic prob-

lems were more common than trauma [19]. In light of this, the humanitarian medical crisis following a natural disaster is probably more illness dominant than trauma dominant. The next HDFHs should be planned to undertake the strenuous efforts of disease control and prevention, rather than focusing mainly on complex surgical capabilities.

Since 1953, the IDF-MC has dispatched 16 humanitarian aid delegations. Three of them – to Haiti, the Philippines and Nepal – were dispatched in the past 6 years. As each delegation deployed its HDFH in a recent disaster zone, the mere act of participation posed a danger to the HDFH staff. Yet, the number of participants increased over time. The last HDFH to Nepal was the largest in the IDF-MC's history, with a staff of 126 participants, with many more who wished to participate left disappointed. Moreover, many Israeli civilian physicians and nurses arrived at the disaster zones on their own and joined the HDFH staff voluntarily. These civilian volunteers contributed significantly to the HDFHs' activity and cared for dozens of patients. Numerous professional men and women were, and still are, willing to risk their lives to fulfill the IDF-MC oath they took: "To extend a helping hand to the wounded and to the sick, whether lowly or distinguished, friend or foe, and to every man whosoever" [20]. Moreover, the number of the Nepali HDFH staff was not only larger but also more efficient. Both departure and deployment times were shorter in the Nepali HDFH than in the Haitian. Hence, the HDFH staff demonstrated its ability to quickly learn and adapt.

LIMITATIONS

This study has several limitations. Due to its retrospective design, the study relied on medical records and operation logs. However, we only assessed data that were readily available in any record or log, e.g., gender and HDFH capacity. Thus, we believe that the retrospective nature of our study did not skew our results. Additionally, this study compared HDFHs that deployed in different countries, with different geography, culture and national infrastructure. It is obvious that no disaster is identical to another, and the next HDFH will face new challenges. However, trends that were demonstrated in three different HDFHs may highlight international cross-cultural issues and should be taken into consideration in the next HDFH plans. Lastly, this study did not compare data from non-Israeli HDFHs, since such data are not internationally available.

CONCLUSIONS

This study demonstrated that the IDF-MC can deploy its HDFHs in a completely autonomic "stand-alone" structure, as well as in a "hybrid" structure. The HDFH structure is tailored to care for the specific needs of each disaster and nation. The next HDFH should be planned to address a significant number of routine medical illnesses, especially several days after the onset of the disaster. This study was part of the IDF-MC learning process, aimed at enabling future HDFHs to save more lives. We

thank each and every participant in any of the IDF-MC humanitarian aid delegations since 1953. Extending a helping hand to foreign populations in crisis is a privilege that was made possible only by the contribution of these professional men and women.

Correspondence

Dr. T. Bader
 email: drtarifb@gmail.com

References

1. CRED. The human cost of natural disaster 2015: a global perspective [cited 2016 July]. Available from: <http://reliefweb.int/report/world/human-cost-natural-disasters-2015-global-perspective>.
2. Bilham R. Lessons from the Haiti earthquake. *Nature* 2010; 463 (7283): 878-9.
3. Survey USG. U.S. Geological Survey – Haiti Earthquake. Available from: <http://earthquake.usgs.gov/earthquakes/eqinthenews/2010/us2010rja6/#summary>.
4. Portal NDRR. Nepal Disaster Risk Reduction Portal – Incident Report of Earthquake 2015 [cited 2016 July]. Available from: drportal.gov.np.
5. Council TPNDRRaM. Effects of Typhoon "Yolanda" (Haiyan) [cited 2016 July]. Available from: [http://www.ndrrmc.gov.ph/attachments/article/1329/FINAL_REPORT_re_Effects_of_Typhoon_YOLANDA_\(HAIYAN\)_06-09NOV2013.pdf](http://www.ndrrmc.gov.ph/attachments/article/1329/FINAL_REPORT_re_Effects_of_Typhoon_YOLANDA_(HAIYAN)_06-09NOV2013.pdf).
6. WHO-PAHO guidelines for the use of foreign field hospitals in the aftermath of sudden-impact disasters. Washington, DC: Pan American Health Organization, 2003 (<http://www.who.int/hac/techguidance/pht/FieldHospitalsFolletto.pdf>).
7. Kreiss Y, Merin O, Peleg K, et al. Early disaster response in Haiti: the Israeli field hospital experience. *Ann Intern Med* 2010; 153 (1): 45-8.
8. Bar-On E, Abargel A, Peleg K, Kreiss Y. Coping with the challenges of early disaster response: 24 years of field hospital experience after earthquakes. *Disaster Med Public Health Prep* 2013; 7 (5): 491-8.
9. Bar-On E, Lebel E, Blumberg N, Sagi R, Kreiss Y. Pediatric orthopedic injuries following an earthquake: experience in an acute-phase field hospital. *J Trauma Nurs* 2015; 22 (4): 223-8.
10. Merin O, Kreiss Y, Lin G, Pras E, Dagan D. Collaboration in response to disaster – Typhoon Yolanda and an integrative model. *N Engl J Med* 2014; 370 (13): 1183-4.
11. Bar-Dayana Y, Beard P, Mankuta D, et al. An earthquake disaster in Turkey: an overview of the experience of the Israeli Defence Forces Field Hospital in Adapazari. *Disasters* 2000; 24 (3): 262-70.
12. WHO Classification and Minimum Standards For Foreign Medical Teams In Sudden Onset Disasters [cited 2016 July]. Available from: http://www.who.int/hac/global_health_cluster/fmt_guidelines_september2013.pdf.
13. Malish R, Oliver DE, Rush RM Jr, Zarzabal E, Sigmon MJ, Burkle FM Jr. Potential roles of military-specific response to natural disasters – analysis of the rapid deployment of a mobile surgical team to the 2007 Peruvian earthquake. *Prehosp Disaster Med* 2009; 24 (1): 3-8.
14. Halpern P, Rosen B, Carasso S, et al. Intensive care in a field hospital in an urban disaster area: lessons from the August 1999 earthquake in Turkey. *Crit Care Med* 2003; 31 (5): 1410-14.
15. von Schreeb J, Riddez L, Samnegard H, Rosling H. Foreign field hospitals in the recent sudden-onset disasters in Iran, Haiti, Indonesia, and Pakistan. *Prehosp Disaster Med* 2008; 23 (2): 144-51; discussion 52-3.
16. Schultz CH, Koenig KL, Noji EK. A medical disaster response to reduce immediate mortality after an earthquake. *N Engl J Med* 1996; 334 (7): 438-44.
17. Bar-On E, Blumberg N, Joshi A, et al. Orthopedic activity in field hospitals following earthquakes in Nepal and Haiti: variability in injuries encountered and collaboration with local available resources drive optimal response. *World J Surg* 2016; 40 (9): 2117-22.
18. Bar-On E, Lebel E, Kreiss Y, et al. Orthopaedic management in a mega mass casualty situation. The Israel Defence Forces Field Hospital in Haiti following the January 2010 earthquake. *Injury* 2011; 42 (10): 1053-9.
19. van Berlaer G, Staes T, Danschutter D, et al. Disaster preparedness and response improvement: comparison of the 2010 Haiti earthquake-related diagnoses with baseline medical data. *Eur J Emerg Med* 2016. Epub 2016/03/12. doi: 10.1097/mej.0000000000000387. PubMed PMID: 26967576.
20. Israel Defense Forces Medical Corps oath [July, 2016]. Available from: <http://www.refua.atal.idf.il/1176-he/Refuah.aspx>.