

## Emergency Department Function Under Missile Attacks in a Haifa Hospital

Fuad Basis MD<sup>1</sup>, Moshe Michaelson MD<sup>1</sup>

<sup>1</sup>Staff Physician, Department of Emergency Medicine, Rambam Medical Center, Haifa, ISRAEL

### Abstract

The authors describe the operations of the ED and policies while working under the threat of rocket attacks in Haifa, Israel in July 2006. The ED managed 175 adult civilian casualties: 60 wounded and 115 suffering psychological trauma. Injuries to the limbs accounted for 40% and blast injuries to the ears were 30% of all traumas. Strategies to decrease the length of stay of patient in the ED included minimizing ED work up and expediting transfer of admitted patients to in-hospital units.

**MeSH Words:** Emergency Department, mass casualty event, disaster preparation, Israel, injury, war

### Introduction

Rambam Medical Center is a 950 bed referral hospital in the city of Haifa, in the north of Israel. The institution has two independently managed and functioning EDs: one for adults and one for pediatric patients. The monthly census for adult Emergency Department (ED) visits is 9500 and 50% of these are fast-track type of patients. The ED has 34 beds, but due to overcrowding often there are up to 40 patients on stretchers.

The hospital is located on the seashore, very close to Israel's main seaport and industrial chemical complex, bringing it in dangerously close proximity to strategic targets for enemy

missiles. From July 13 to 26, 2006 more than 15 waves of missiles were fired at Haifa from Lebanon and approximately 40 rockets hit the city. Several exploded about 20 meters from the hospital, inflicting injuries to visitors, and causing material damage to other areas. Living under fire has been shown to be an emotionally stressful situation for the public [1] but this was the first time that care givers in this institution were forced to work under the threat of rocket attacks. As a result, the ability of the human resources to adapt to this situation and maintain high quality care was unknown.

The goal of this manuscript is to describe the policies developed in order to maintain a functional ED while working under the threat of

rocket attacks and to list the major categories of missile blast related civilian casualties encountered in this hospital.

### **Narrative and Results**

#### *The ED in a city under fire*

The first rocket attack on Haifa on July 13<sup>th</sup> caused no casualties.

On the July 16<sup>th</sup>, 2006 a missile hit a train station in Haifa, 45 injured citizens were managed in our ED. Immediately after the missile strike we were informed by the emergency ambulance service (MDA Magen David Adom) about the approximate number of injuries in the field. A representative of the MDA stayed with us and gave us continuous information about the incoming casualties. Soon after hearing the siren our ED was evacuated. Patients with a clinical likelihood of admission were immediately admitted and sent to the various inpatient departments. Patients who were clinically unlikely to need admission were sent home. Those who needed further investigation were sent to a corridor nearby the ED, and later on, after the situation cleared, were brought back to the ED for further investigation. This scenario was repeated each time the air raid siren was sounded.

In the first missile attack, 16 injured citizens and 19 anxiety cases reached our ED. A triage trauma physician stood at the entrance of the ED and triaged the different injuries as severe, moderate or mild according to accepted criteria. Those who came with anxiety were referred to the hospital's dining room that was designated temporarily as the anxiety treatment center. There, they would be treated by psychiatrists, psychologists and by internal medicine specialists. Throughout the war, most of the anxiety cases were discharged within few hours from their arrival. A small minority was referred to the ED later on for physical complaints, such as chest pain.

#### *Adapting to the Emergency*

During the days of the war, the nursing staff of the ED switched to 12 hours shifts. A significant number of them transferred their children to the south of Israel, rendering them safer, and

themselves less concerned about their family's safety.

In order to reduce the possibility of injuries to the patients hospitalized in the departments on the northern side of the hospital (facing Lebanon), they were all transferred to the southern side of the building and some were discharged home. Most of the ambulatory service in the hospital was reduced significantly. The number of patients admitted to our ED decreased by one third on average during the weeks of the war. All of these things contributed to the reduction in hospital inpatient occupancy from 92% to 57% during the conflict.

The ED functioned with 8 – 10 beds (instead of the usual 34) and the number of visits averaged 200 patients per day. The average workup time was not reduced very much - from 2.8 hrs before the war to 2.4 hrs during the war. Nonetheless, the ED was never overcrowded.

During the war, several events dictated the need to reevaluate and change the mode of ED function. First, the Ministry of Health did not declare a state of highest emergency and in light of this the use of the ED by regular patients continued. In addition, Rambam is the referral hospital for all of northern Israel and therefore we needed to plan for multiple casualties being sent in from many places. This entire situation required that dynamic planning was needed so that the ED and institution could rapidly adapt as needed.

After the first attack, information on all injuries was entered into a database. After each attack, a review was held on the performance of all participants. Deficiencies were identified and corrected, and new protocols were written in order to better manage subsequent casualties. The ED was reformatted for the new situation. Twenty-four beds were held open on standby exclusively for war related civilian casualties. The other 10 were used for regular ED visits.

This obliged us to change our practice in many cases, i.e. performing the minimal workup needed, immediate transport to of patients to the departments once admission was decided on, immediate discharge of patients home for non urgent workup, and finally by admitting only emergent cases. We also monitored the number and profile of regular visits to our ED as our ED

continued to function normally, albeit with only one third of the number of beds.

Our hospital is located near the port of Haifa, and missiles fell a few hundred meters to both sides of it. We were constantly aware that our hospital may be hit by a missile at any time. On July 25, one of the missiles hit the road in the front of the hospital. Many cars belonging to the staff were damaged, and several of the hospital employees suffered from anxiety.

### War Injuries

Injuries from a rocket missile are considered as low velocity injuries (LVM) as the speed of the particle is less than 2000 ft/sec. In LVM no significant energy is transferred to structures adjacent to those tissues directly affected. LVM injuries are usually easily recognized at surgery and the wound tract plays the major role in predicting which organs are likely to be injured [2].

From the 16<sup>th</sup> till the 26<sup>th</sup> of July we received 60 wounded citizens. Twelve of them were severely injured, and 27 were discharged after primary investigation and treatment in the ED. A total of 115 anxiety cases were examined and treated by the anxiety trauma center, without passing through the ED.

Injuries were mainly caused by shrapnel. There were very few who were injured by items that fell during the crash of buildings. Since most of the injured were by low velocity particles, large soft tissue damage was very rare. In some cases the injury seemed very superficial, but on further investigation was found to be more extensive such as subarachnoid hemorrhage or pneumothorax. The most common sites of injury were in the limbs (40%) and blast injuries to the ears (30%). (Figure 1).

### Operational Aspects

As a referral hospital and the main trauma center in the north of Israel, we are accustomed to dealing with mass casualties. Every hospital in Israel is required by law to have written protocols to deal with a mass casualty scenario. But working under the danger of missile strikes is uncommon and poses additional challenges. The staff functioned well, highly focused on

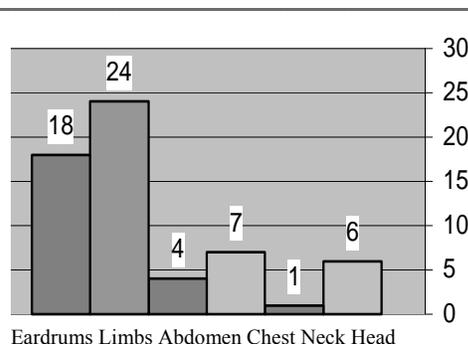


Figure 1: Site of main injury (n = 60)

their jobs, despite hearing bombs falling close to us. In the first couple of days of the war, in the few minutes after hearing a siren, the staff was concerned and focused on their families' safety. This feeling improved after they moved their families to the south of Haifa and thus they could concentrate better on their work.

Our hospital was not built for this scenario. We have no underground ED. The transfer of some departments from one side of the building to the other was not easy. The maintenance department had to work hard for an entire week to prepare the logistics for the transfer of some departments. Many departments were placed together in a big basement with no privacy for patients.

Information about casualties reached us online by M.D.A. (Israeli EMS). As in other cases [3], the number of wounded expected to arrive was not consistently reliable. That is in part because the information came from different sources in the pre-hospital triage system, and because of the diversion of wounded to other hospitals in the town according to their number and severity of injury.

Many centers across the world have protocols for mass casualties' management, some of which are very complicated [4]. Peleg et al from the Israel National Center for Trauma and Emergency Medicine Research have suggested not setting fixed protocols for mass casualties, but rather principles only [5]. This time our ED faced a new kind of war and a different scenario of injuries. In the first missile attacks, staff from different departments crowded the ED, some to help and some out of curiosity, rendering it impossible to function properly. Subsequent to the first attack, a decision was taken that only staff on duty was allowed to enter the ED.

Staff on duty were identified by a vest they wore. Those in key positions had a tag that identified their role. The medical staff for each trauma victim consisted of a surgeon, an orthopedic surgeon and two nurses. A coordinating nurse was in charge of every four cases. There was a manager of the shock (trauma) room, a few other managers with specific duties, and a manager for the entire scene (chief coordinator). The rest of the medical staff and consultants were called in from outside the ED according to our needs. This allowed us to control the environment more effectively.

Communication difficulties in mass casualties in general are myriad [6]. In the first attack our cell phones failed, and communication between us became very difficult. To overcome this problem, we had to use the general announcement system in the ED, and this proved to be inefficient. Thereafter, those who were in coordinating positions were equipped with wireless devices to communicate with each other, thus better able to control the scene, and to transfer consultants and staff as needed. When a certain team needed help or a specific consultant, they informed the coordinator in charge. This pattern of function proved to be effective. After each case, our function was revised, feedback was given, and new decisions were taken to improve our functioning.

The triage of anxiety victims to the hospital dining room proved to be very successful, as they were far more numerous than those who were physically wounded. This helped prevent overcrowding of the ED, and allowed for better care of wounded patients.

Drawing on our experience with suicide bombings, the information center that gives information to families was set far from the ED. Family members of the wounded were referred to the information center, thus preventing overcrowding of the ED with worried family members.

During the war period, our ED continued to receive regular patients. The number of visitors to our ED declined only by one third. Despite the fact that we functioned with less than one third of our beds our ED was not felt by providers to be overcrowded. At the same time our ED functioned according to its basic role i.e. treatment and triage of patients towards

admission or discharge within the minimum time needed.

### Conclusion

During a month long emergency situation, there was good internal functioning of the ED, good cooperation of other departments' staff with the needs of the ED and satisfactory cooperation of citizens who visited the ED with problems unconnected to the war. We believe that examining our operation after each attack led to continuous improvement in our functioning and in better control over the event. Focusing on principles rather than fixed protocols allowed us to make adjustments according to changing situations and needs.

### References

1. Yagur A, Grinshpoon A, Ponizovsky A. Primary care clinic attenders under war stress; *Isr Med Assoc J*, 2002; 4(7):568-72.
2. Feuchtwagner M: High velocity missile injuries: a review. *J Royal Soc Med*, 1982; 75:966- 969.
3. [Johnson GA](#), [Calkins A](#): Prehospital triage and communication performance in small mass casualty incidents: a gauge for disaster preparedness. [Am J Emerg Med](#). 1999; 17(2):148-50.
4. [http://www.hscbklyn.edu/emergency\\_medicine/pdf.docs/KCHCSection03.pdf](http://www.hscbklyn.edu/emergency_medicine/pdf.docs/KCHCSection03.pdf)
5. Peleg K, Michaelson M, Shapira SC, Aharonson-Daniel L: Principles of emergency management in disasters. [Adv Ren Replace Ther](#). 2003; 10(2):117-21.
6. [www.upmc-biosecurity.org/pages/resources/hearings/inglesby\\_01.html](http://www.upmc-biosecurity.org/pages/resources/hearings/inglesby_01.html)

**Competing Interests:** None declared

**Funding:** None

This manuscript has been peer reviewed

---

**Correspondence:**

Dr. F. Basis  
Department of Emergency Medicine  
Rambam Medical Center  
PO Box 9602  
Haifa 31096 Israel  
Tel: 972 4 854-2348  
Fax: 972 4 854-3235

**e-mail:** [f\\_basis@rambam.health.gov.il](mailto:f_basis@rambam.health.gov.il)