

# Emergency Department under Missile Strikes: Emphasizing the Intrinsic Factors for Overcrowding

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## Abstract

**Introduction:** For a period of 30 days between July and August 2006, the Emergency Department (ED) at Rambam Medical Center functioned under missile attacks. Two thirds of the beds were set aside for injured people, leaving only one third of the beds for other patients. Despite this abrupt 66% decrease in the number of beds, and a decrease of only one third in the number of regular visits, our ED was far from being overcrowded during that period of time.

**Objectives:** To describe the functioning of our ED under fire, thus gaining new insights on ED overcrowding from a unique perspective that is difficult to artificially create.

**Results:** There was a 36% decrease in the number of visits to our ED. There was also a 43% decrease in the hospital's bed occupancy rate. There was a statistically significant decrease in the visits of the elderly population (>70 years of age) to the ED, but no decrease was seen in the younger population. The mean evaluation time during this period, decreased from 2.8 to 2.4 hrs (not significant), but the average total length of stay decreased significantly (from 6.4 to 2.7 hours). Despite doubling the occupancy rate for each functioning bed, our ED was far from overcrowded.

**Conclusions:** The availability of physicians, laboratory and imaging services and many empty beds in the hospital (intrinsic factors), are more crucial in preventing ED overcrowding than decreasing the number of non-urgent visits to the ED (extrinsic factors).

**Keywords:** Overcrowding; Emergency department; Length of stay; Wartime; Non-urgent visits

## Introduction

Rambam Medical Center is a tertiary care referral hospital with 898 beds. Our Emergency Department (ED) has 34 beds with an average of 9500 visits per month. We have previously shown that working systematically and efficiently reduce patients' length of stay (LOS) in the ED [1]. However, we still have a very crowded ED during "rush hours". We often have to add 15 extra beds to the ED to alleviate overcrowding.

In 2006, for a whole month, between the 13<sup>th</sup> of July and the 12<sup>th</sup> of August, Haifa was hit by more than 45 rockets, several of them falling about 20 meters away from the hospital perimeter. Working under these conditions is naturally very stressful [2]. On July 16, 45 injured civilians were referred to our ED. After this first wave of injuries, we prepared our ED for this new situation. Even though all the hospitals in northern Israel were under fire, our ED, like the others, continued to accept regular patients. 24 beds and one third of the medical staff were set aside for treating injured civilians in future attacks, leaving our ED with 10 beds and 2/3 of the medical staff for regular tasks. Because of the shortage in both beds and staff in the ED, we did the minimal necessary work-up that was needed in order to move patients immediately out of the ED after a decision about their medical treatment has been made.

While the number of available beds in the ED decreased by two-thirds, the number of visits to the ED decreased by only one-third. That meant that the patient burden doubled for each bed. Yet despite that our ED was far from being overcrowded.

What was the reason for the non-crowding in the ED during this period? Was it the pattern of visits (i.e. urgent visits only), or the functional changes made in the ED?

Previous studies tried to define the criteria for urgent visits. In some studies, the criteria were determined by the triage nurse in the ED, who decided according to a triage scale which case was urgent

and which was not. In other studies the criteria for the medical staff was to retrospectively assess whether a visit was urgent or not. In yet other studies, the patients themselves were retrospectively asked after discharge whether their condition has been urgent or not [3-5]. The percentage of non urgent visits found was greatly dependant on the method used. The percentage of non-urgent visits ranged from 14% to more than 50%.

During the month that the missile attacks occurred, the people in our area had to think carefully if their condition was urgent enough to warrant leaving their homes and visiting the hospital ED under a missile attack. The roughly one third reductions in the visits to the ED during that month can constitute another measurement as to the percentage of non-urgent visits to the ED.

There are also differences of opinion regarding the definition of overcrowding [6]. Drummond, for example, wrote that EDs were planned in such a way that if patients stayed there for more than 4 hours, the ED becomes overcrowded [7]. In our ED, for example, when patients stay for more than 3 hours on average after a decision for admission has been made; extra beds are needed to be brought into the ED.

## Objectives

To describe the functioning of our ED under fire in order to gain

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new insights on ED overcrowding from a unique perspective that is difficult to create artificially.

## Methods

### Data collection and analysis

This is a statistical, observational study that started on the second day of the war. We compared the performance of our ED during wartime (July – August 2006) to the same period a year before. Data about the pattern of visits to our ED was collected daily from the reception desk. These visits are usually categorized according to the main reason for admission: trauma, non-trauma, paediatric, obstetric, ophthalmic, and other specific categories. The demographic data and the diversity of reasons for coming to our ED were compared to those in the parallel period in 2005.

### Interventions

Since this was a statistical observational research which did not interfere with the patients' care management, there was no need for permission from the hospital's Helsinki Committee.

### Primary data analysis

The statistical analysis was performed by a statistician using the Chi Square test.

## Results

A day after the first attack there was a steep decline in the number of visits to our ED. During those 30 days there was a 36% decrease in the number of visits to the entire ED. The distribution of visits to the different sections of the ED did not change significantly. When we examined the percentage of admissions from the ED to the hospital, we found a small but statistically significant ( $p=0.03$ ) increase in the percentage of admissions from the trauma part of the ED (Table 1). The increase in the admissions from the trauma unit was due to war injuries.

The missile attacks happened during the day (from late noon until early evening). When we examined the influence of that on the pattern of visits to our ED, we found a significant decrease in the visits during the evening shift (15:00–23:00) ( $p=0.0001$ ) and a significant increase in the number of visits during the night shift (23:00–7:00) ( $p=0.014$ ) (Figure 1). However, the total number of visits for the entire day decreased significantly.

When we compared the influence of this new situation on the breakdown of visits according to age groups, we found a significant drop in the number of visits to our ED among those who were above the age of 70 ( $p=0.003$ ) and a significant increase among those whose age was 60–70 years ( $p=0.04$ ). We did not find a significant non proportionate decline in the pattern of visits to our ED in the younger age groups, as we expected.

There was a non-significant decrease in the average evaluation time of patients during war time compared to the parallel period a year before (from 2.8 hrs 2.4 hrs) ( $P = 0.1$ ), but the average total length of stay (LOS) in our ED decreased dramatically from 6.4 to 2.7 hours ( $P = 0.002$ ).

Our hospital occupancy dropped until the end of the war by 43%. This was not due to a shift of visits to the two other hospitals in the city since their occupancy dropped too, but less significantly (34% and 32% respectively). In comparison, the occupancy in the largest two hospitals in the centre of Israel where there were no missile attacks did not change during the wartime compared to the same period a year before (105.3% vs. 104.8%  $p= 0.2$ , and 102.1% vs. 103.4%  $p= 0.17$ , respectively).

## Discussion

In our study, we tried to compare the number and pattern of visits to our ED during wartime to the same period a year before. The number and pattern of visits in July – August 2005 was identical to those in the same period in 2004. Therefore, it is logical to compare our results from 2006 to those of the same period a year before. Furthermore, we thought that a comparison between these two summer periods would also be better in abolishing the influence of seasonal illnesses on the study.

Shifting non-urgent visits from the ED to a primary care setting has been suggested by many as a way of reducing overcrowding in emergency departments [5]. In our country, some medical funds (insurances) encourage primary GPs to add a nurse to their staff. She can take care of the non urgent cases thus reducing costs and congestion in the primary caregiver's office. The same should hold true when non urgent visits are shifted away from the ED to primary care physicians, since this will reduce non urgent visits to the emergency departments. The Leonardo project has shown that this concept is feasible [8]. Furthermore, all the medical funds in our country have active 24 hr telephone help lines, staffed by a nurse to give medical advice to people with emergency medical situation. This type of phone triage also reduces non urgent visits to the emergency departments.

In most studies, the criteria for defining urgent visits were usually established by the researchers themselves. These criteria did not always correlate well with the criteria that the patients themselves determined as to what is urgent and what is not. In some studies, a high percentage of the cases (up to 82%) of what the authors classified as non-urgent visits, the patients classified as urgent. This reflects the discrepancy between physicians and patients as to what they classify as non urgent visits [9,10]. So what is the exact percentage of non-urgent visits to the ED?

In our study the patients themselves, and not the medical staff, had to make a real time decision if their condition was urgent enough and warranted going to the hospital under fire. We believe that the behavioural changes in the number and pattern of visits in our study are meaningful and representative rather than random changes.

Some researchers found that younger people and females tend to make more non-urgent visits to the ED [11,12]. The lack of medical insurance did not seem to be the reason for this phenomenon since it did not correlate well with those who made frequent non-urgent visits to the ED [13,14]. In Israel, all citizens have medical insurance. Therefore, this point is irrelevant to our study. We assumed, as others did, that non-urgent visits are more common among the younger population, but here it was not the case. The decline in the percentage of visits was proportional in all age groups, except for a significant decrease among

Date	Total Visits to ED	Non trauma visits	admissions from non trauma	% of admissions from non trauma	Trauma visits	admissions from trauma	% of admissions from trauma
7-8/2005	9074	3720	1636	44%	2722	380	14%
7-8/2006	5794	2522	1084	43%	1680	284	17%

**Table 1:** Number of visits to various parts of the ED and percentage of admissions from each part before wartime and during wartime.

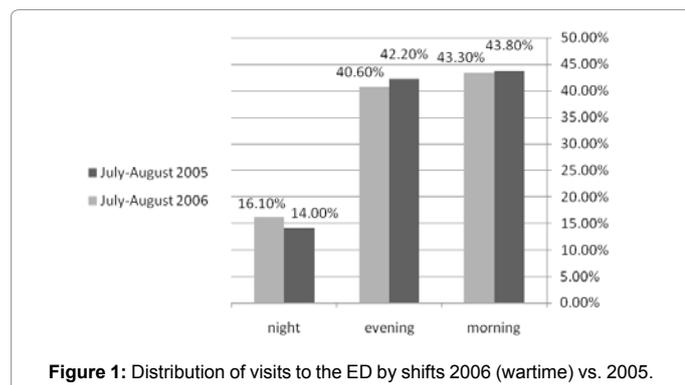


Figure 1: Distribution of visits to the ED by shifts 2006 (wartime) vs. 2005.

those who were older than 70 years of age. There was also a significant proportional increase among those who were 60-70 years of age. We think that the decrease in the number of visits among those older than 70 years was mainly due to a 72% decrease in referrals to our hospital from geriatric care institutions. The small increase among the 60-70 year old visits could be explained by the closure of most of the offices in the northern part of country including the primary care clinics, and due to the high prevalence of chronic illnesses among this age group. As an aside, it would be interesting to see how nursing homes, even those in proximity to our hospital, managed to treat for a whole month over 2/3 of their previously referred patients without the need to refer patients to our ED. It would also be interesting to see if there were any adverse outcomes due to these decisions. There is no doubt that the behaviour of people during wartimes is complicated, and is worth doing a thorough psychological study.

As previously mentioned, the proportions of people visiting the different parts of the ED remained unchanged. More than that, we expected that the percentage of admissions from the ED to the hospital would increase as only urgent and more serious cases visited our ED. But this was not the case (Table 1). There was a small, but statistically significant increase in the percentage of admissions to the hospital during wartime because of trauma, most probably due to the wounded (17% vs. 14%).

On dealing with ED overcrowding, we experienced overcrowding in the ED in the past, and sometimes ambulances had to wait 10 minutes for an empty bed. During the wartime we almost always had an empty bed for the next coming patient. When we compared the evaluation time in normal days to those during the study period, we were surprised to find a small and statistically non-significant decrease. We did however find a significant difference in the LOS after making a decision. Normally, after a 2.7 hrs of workup, patients wait another 4.5 hours on average (up to 8 hrs) to be transferred to the wards. Since our ED functioned very efficiently and patients were evaluated and treated in the minimal time needed for admission or discharge, and since there were plenty of empty beds in the hospital during this period, the patients were transferred to the wards immediately after a decision for admission was made.

### Limitations of the Study

In retrospect, this study could have been more accurate in dealing with non urgent visits if it would have included all the three hospitals in the city and contrast it to three major hospitals in the centre of the country where there were no missile attacks. However, the trend seen concerning the lack of ED overcrowding as a reflection of the function of our ED and our whole hospital during wartime should be a valid conclusion based on our hospital alone.

We have concluded that visiting a hospital under fire and the reduction of one third of the visits reflects the percentage of non urgent visits to our ED. We can't supply any extrinsic proof to this conclusion, as it is difficult to predict the behaviour of patients during wartime. Yet we think that a whole month is sufficient to make our conclusions valid.

Lastly, we have compared the data at wartime to the same period a year before and not to that of the previous month. Since the pattern of visits in the same periods during 2004 and 2005 were statistically identical, we thought that it would be more appropriate to compare our results during 2006 to those in the same period a year before.

In summary, our conclusion is that non-urgent visits to the ED are not responsible for ED overcrowding ("extrinsic factor"). Schull et al. showed that non urgent visits are not time and lab consuming, and their LOS is relatively short [15]. Doubling the number of beds in the ED is also not the solution as shown by Han et al. [16]. Our study indicates that the influence of a different and more efficient functioning of the ED, and an increase in the number of empty beds in the hospital ("intrinsic factors") even with a relatively significant reduction in the number of beds in the ED, are more crucial to prevent ED overcrowding than the "extrinsic factors" mentioned above.

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