



Original Contribution

Facilitating emergency hospital evacuation through uniform discharge criteria☆☆☆



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ARTICLE INFO

Article history:

Received 8 October 2016

Received in revised form 29 December 2016

Accepted 29 December 2016

ABSTRACT

Background: Though hospitals' operational continuity is crucial, full institutional evacuation may at times be unavoidable. The study's objective was to establish criteria for discharge of patients during complete emergency evacuation and compare scope of patients suitable for discharge pre/post implementation of criteria.

Basic procedures: Standards for patient discharge during an evacuation were developed based on literature and disaster managers. The standards were reviewed in a two-round Delphi process. All hospitals in Israel were requested to identify inpatients' that could be released home during institutional evacuation. Potential discharges were compared in 2013–2014, before and after formulation of discharge criteria.

Main findings: Consensus exceeding 80% was obtained for four out of five criteria after two Delphi cycles. Average projected discharge rate before and after formulation of criteria was 34.2% and 42.9%, respectively ($p < 0.001$). Variance in potential dischargeable patients was 31-fold less in 2014 than in 2013 (MST = 8,452 versus MST = 264,366, respectively; $p < 0.001$). Differences were found between small, medium and large hospitals in mean rate of dischargeable patients: 52.1%, 41.5% and 42.2%, respectively ($p = 0.001$).

Principle conclusions: The study's findings enable to forecast the extent of patients that may be released home during full emergency evacuation of a hospital; thereby facilitating preparedness of contingency plans.

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1. Introduction

Hospitals play a vital role in emergencies and ordinary times alike, providing a critical framework that caters to the community's needs and promotes its sense of security [1,2]. While ensuring operational continuity is of paramount importance, at times evacuation of a medical facility may be unavoidable – due to fire, earthquake, terror incident, or any other situation that places patients and personnel at risk [1,3–6].

Numerous hospital evacuations have been described in the literature. In the years 1971–1999, 275 medical centers were evacuated due to one of the following causes: fire (23%), hurricane (14%), earthquake (9%), flooding (6%), collapse of infrastructure (5%), and internal or

external leakage of hazardous materials (18% and 4% respectively) [7]. Most probably, additional hospitals were evacuated at the described period resulting from various emergency scenarios, but due to lack of press coverage or other means of reporting, they were not included in the documented statistics. In 1994, following the earthquake at Northridge, eight hospitals were evacuated in Los Angeles [8]. More than 20 hospitals had to be evacuated in the United States in 2005 in the wake of Hurricane Katrina [2]. In 2010 a forest fire necessitated the evacuation of an entire psychiatric hospital in Israel [9] and threatened an additional facility, which was prepared for evacuation. Several medical institutions were evacuated in New York in 2012 following Hurricane Sandy, among them some leading public hospitals, despite the early warning that was issued which enabled implementation of early emergency preparedness measures [4].

Hospitals operate continuously 24/7. Occupancy tends to be high, and hospital populations comprise of vulnerable and sensitive patients [3] as well as extensive medical and support staff. Planning the evacuation of a medical center is thus a complex process [1,3–6] in which logistic challenges have to be addressed [1–2,9–10].

☆ This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

☆☆ There are no conflicts of interest for any of the authors.

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When a disaster dictates complete evacuation of a hospital, some of the patients can be released directly to the community. A study of the evacuation of 62 hospitals in Los Angeles found that 22–30% of the patients could be discharged home [2], while the rest needed to be relocated to other hospitals. In some cases the decision to discharge patients to their homes in the framework of the emergency evacuation was guided based on defined criteria, e.g. the patients were fit to be immediately released to the community or were already slated for discharge within 24 to 72 h from the time of evacuation [11]. Nonetheless, clear and consistent criteria for patient evacuation, including the distinction of the destination of the evacuation, is still missing [4, 12].

Discharging patients directly to the community, rather than evacuating them to alternate medical facilities, may significantly decrease the burden [1]. Thus, there is great value in identifying elements that may facilitate the release of patients to their homes. In view of the assumption that defined criteria [12] may increase the number of hospitalized patients that can be discharged home during an emergency hospital evacuation, a comprehensive study was undertaken. The aim was to establish criteria regarding discharge of hospital patients to home during complete evacuation of a medical facility and to compare the number of patients deemed suitable for discharge prior to and after definition of these criteria.

2. Methods

A survey of the scientific literature published in English from 1990 to 2013 was conducted through PubMed and Cochrane search engines using the following keywords: hospital evacuation, emergency health care facility, surge capacity, triage, discharge criteria, and evacuation standards. The survey was continued throughout the study, to include additional articles that were published up to 2015 inclusive.

Standards governing the release of hospitalized patients to the community in situations of full hospital evacuation were defined based both on the literature review and on the recommendations of the Israeli National Advisory Committee on Hospital Evacuation. In the framework of a two-round Delphi process, these standards were disseminated to 36 content experts, 20 of them members of the Committee; 16 were experts in the field of disaster management or hospital directors. The content experts were asked to express agreement or disagreement regarding each of the standards and to propose additional standards for patient discharge. Agreement between experts was defined as consensus in excess of 80%.

Following the approval of the Ministry of Health, all 26 general hospitals in Israel were requested to evaluate the needs of their inpatients and identify those that could be released to the community in a situation requiring full evacuation of the institution. The evaluations took into account the volumes of inpatients (occupancy rates of the Israeli hospitals ranged in the study years from 78% to 125%, with an average of 95%) and average length of stay (4.3 days) [13]. Two cycles of such evaluations were conducted in the general hospitals during the years 2013–2014. The first round of mapping was conducted in 2013 prior to the establishment of uniform criteria for patient release to their homes and relied on the personal judgment of the staff of each hospital department. A second round of mapping was performed in 2014, following the distribution of uniform criteria for patient release; thus, the hospital teams used the newly developed standards for identifying patients that could be discharged to the community.

The patients found suitable for discharge to the community were collected in an Excel spreadsheet listing the overall number of hospitalized patients and the number of patients that can be discharged.

The rates of inpatient discharge in the simulated evacuation as determined in 2013 and 2014 – before and after the formulation of the standards – were compared for hospitals with matching characteristics. Hospitals were divided into three categories according to size: 1) large, with >700 beds (N = 6); 2) medium, with 400–700 beds (N = 8); 3)

small hospitals with fewer than 400 beds (N = 5). They were also classed according to location: urban (N = 10) or rural (N = 9). The different hospital departments were grouped together in five healthcare divisions as follows: pediatric, obstetrics/gynecology (OB/Gyn), surgery, internal medicine and intensive care. The data were analyzed using SPSS software. Chi square analysis was used to examine relationships between hospitals' characteristics and the percentage of inpatients dischargeable to the community. One-way ANOVA was used to examine the variability in discharge before and after the establishment of the discharge standards.

3. Results

3.1. Formulation of criteria for releasing patients to the community and testing them using the Delphi technique

Based on the literature review, three standards were formulated directing the discharge of patients to their homes. The standards were then forwarded to 36 content experts for validation. The response rate was 67% (N = 24), and agreement of over 80% was found in regard to each of the three standards. In this first round, the content experts proposed two additional standards to be incorporated in the medical directives regarding inpatients to be discharged home during hospital evacuations. In view of the high rate of agreement obtained in the first round, the second Delphi round focused only on the newly proposed standards. Among the 18 content experts that responded to the second cycle, consensus exceeding 80% was obtained for only one of the two standards surveyed. The standards disseminated in the Delphi rounds and the degrees of consensus regarding their incorporation in the discharge criteria are detailed in Table 1.

3.2. Percentages of patients who can be discharged during evacuation of a hospital

In the first cycle of evaluating the hospitals' inpatients, conducted in February–March 2013, results were obtained from 19 hospitals (73% response rate). In the second cycle, conducted in February–March 2014, data were received from 20 of the hospitals (77% response rate). In order to conduct paired comparisons, only data from the 19 hospitals that responded in both cycles was used in the analysis.

The percentage of patients slated for discharge in the event of a hospital evacuation as assessed in 2013 in the first round (prior to formulation of the standards) was compared with the percentage as assessed in 2014 in the second round (after formulation of the standards). The average projected discharge rate before and after formulation of the standards was 34.2% and 42.9%, respectively ($p < 0.001$). The variance in the data provided by the different hospitals regarding their ability to

Table 1

Degree of consensus regarding standards for discharge of hospitalized patients to home after each of two Delphi cycles.

Criterion	1st Delphi round, % agreement (N = 24)	2nd Delphi round, % agreement (N = 18)
Patient slated for discharge on same day	100	
Candidate for discharge within 24–48 h, no further treatment needed	87.5	
Patients whose treatment can be interrupted for a brief period ^a	87.5	
Postpartum mother/newborn baby 8–12 h after normal delivery		38.8
Postpartum mother 24 h after vaginal delivery without complications		88.8

^a Including chronic patients, patients admitted for elective surgery, testing, or in-patient evaluation.

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