



Business Continuity During Disasters in The Medical Health System in Israel

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ABSTRACT

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"Business Continuity" is an emergency issue that focuses on maintaining functionality and continuity of services during an emergency. this study, examined the general preparedness of the Israeli hospitals, by selecting ten hospitals and studying the topic of business continuity in these hospitals. The healthcare system in the State of Israel comprises several large organizations that provide various health services. This research was conducted using the mixed methods approaches. First quantitative (questionnaires), and second qualitative (interviews). The major conclusion to this study was that the hospitals in Israel (10 Hospitals) is in good stage of preparation. The study showed some gaps between the level of preparedness in large hospitals and small hospitals in favor of the large hospitals. The study showed that all the hospitals participated in the research perform the required drills and simulations for the staff using different scenarios according to protocols. This study found lack of knowledge among most of the emergency directors. the study showed that in Israel the medical staff is not trained and not instructed on the subject of Business Continuity

KEYWORDS:

Business continuity, emergencies, medical system, hospitals, preparedness, medical staff.

INTRODUCTION

"Business Continuity" is an emergency issue that focuses on maintaining functionality and continuity of services during an emergency. Every organization must have "Business Continuity" planning that enables them to provide services to its clients during emergencies. Hospitals are considered organizations that provide services to patients. "Business Continuity" in hospitals is critical during emergencies. If the chain of "Business Continuity" is impaired, the continuity of treatment for the patients will be adversely affected, thereby endangering the continuity of treatments and the lives of the hospitalized patients.

this study, examined the general preparedness of the Israeli hospitals, by selecting ten hospitals and studying the topic of business continuity in these hospitals. The medical system is considered critical in the event of national disasters; therefore, it is important to examine its general preparedness. Hospitals, like any other organizations, need a good plan and good "Business Continuity" plan to survive and sustain during disasters; otherwise, hospitals must evacuate all patients to another safe location and discontinue their medical services at a very vital moment when the number of patients is rapidly increasing.

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BACKGROUND

"Business Continuity" in hospitals is an issue that still needs to be looked into now and then to learn lessons and reach a situation in which every hospital considers these lessons and implement them in a reality. Health preparedness is one of the biggest and most complex issues in the history of public health studies. According to all studies around the world, repetitive exercises that include simulations of emergencies to multifaceted events can ensure good preparedness for hospital facilities, staff, and patients. Only with repeated drills, including exercises and controls, hospitals can be alerted and prepared for such emergencies.

Emergencies and wars in Israel have a significant impact on the daily routine, especially on the emergency and medical systems. Emergency and disaster situations are classified according to the two factors, a disaster caused by force majeure; natural disasters such as earthquakes and tsunamis, which are common in this region, and disasters caused by humans; conventional and non-conventional. Israel is an example of a country characterized by more disasters caused by humans than by force majeure and therefore is unique in the field of preparedness of the health system.

The medical system and health services are critical in the abovementioned situations. To examine the preparedness of medical services in the country, it is crucial to explore the significance of the "Business Continuity" and to estimate how the health care system can remain functional in case of a national disaster.

Until this day, there are no previous studies that have examined the issue of "Business Continuity" in the State of Israel and the preparedness of hospitals for emergencies. Very few articles have been published on this subject, especially after the Second Lebanon War in 2006. During the Second Lebanon War, the home front was exposed to a broad range of missiles fired from Lebanon by the Lebanese Hezbollah organization. Hospitals in northern Israel were exposed to rocket fires that severely endangered the continuation of treatment in the inpatient departments (especially in Rambam Hospital in Haifa). Tel-Aviv Medical Center was under the threat of a rocket attack launched by Hamas and Islamic Jihad from the Gaza Strip in Operation Cloud in 2012 and Operation Tzuk Eitan in 2014. When the rockets were fired at Tel Aviv, Ichilov Hospital declared an emergency and requested that all patients are moved from their rooms to a protected area (the corridor of the department), which was unreliable and did not provide sufficient protection for patients and families (Ichilov Hospital is built of glass walls). Some sensitive departments, such as the pediatric hematology-oncology department, must be provided with a substitute clean and safe area for patients with weak immune systems. there were no plans (especially children who had bone marrow transplants) to interfere with the treatment continuation for sick children.

The Healthcare System in Israel

The healthcare system in the State of Israel comprises several large organizations that provide various health services. The health system in Israel is very modern and efficient. At the same time, it copes with a large number of challenges and is constantly required to improve and adapt itself to changing conditions and needs. "Mainly, the public healthcare system is financed by tax money and the government's budget. At birth, all Israeli citizens are granted the right to join one of the four official healthcare systems and thus enjoy basic medical coverage. However, coverage can be expanded by purchasing private health insurance. The public health system is intended to provide medical services to the population in a routine manner. For example, preventative healthcare in clinics, health treatment organizations and institutes, community rehabilitation centers, and various health promotion activities such as family planning, physical activity, and a healthy lifestyle" [1].

Israel has a large number of hospitals located in different areas all around the Country. According to the distribution of the population in Israel, most of the hospitals are located in the central region. Some hospitals are general; they are intended to treat a wide range of medical conditions, while others are specialized in a particular type of medical condition.

In Israel, there are 42 healthcare institutions that provide healthcare services, 23 of which are large government-owned medical institutions, and the remaining 19 are privately owned institutions (these are small-capacity medical

institutions which are not under the control of the government and are not used during emergencies). [1]

"The Ministry of Health is one of the governmental ministries in Israel. It is the governmental authority through which the government implements its policy in the entire health system, among other things, through the formulation of the health policy and the setting of priorities and principles of the system's activity" [1]. The Ministry of Health serves as a regulator and service provider and is the governmental body responsible for ensuring the health of the population. Its ministerial duties include supervision and control, licensing, legislation, setting standards, research, training, and planning.

Business Continuity in Medical and Healthcare Services

Hospitals are organizations in every aspect. The structure of hospitals is a hierarchical structure, in which there is a chain of command and management. General Managers, department 38 managers, and personnel. Also, hospital structures include various infrastructures, each of which is supported by a chain of different supplies. Damage to one of the hospital's structures, or damage to its supply chain, can endanger its survival. A hospital has a large population of patients who are supposed to receive treatment with continuity, even in case of an emergency. If a hospital cannot guarantee its survival during a disaster, it then must be evacuated to preserve the lives of patients hospitalized there. Despite business process management being around for more than twenty years, and continuity of care being discussed for over fifty years, healthcare organizations still strive to provide better service to their patients [2].

Healthcare continuity of operation is becoming the subject of increasing concern around the world. Events like terrorist activities, natural disasters, long-term power outages, and the threat of flu pandemic subject healthcare to real risks and makes it necessary to develop "Business Continuity" plans.

The lack of resources or clarity around the direct threat put many healthcare organizations at risk. "Business Continuity" planning is a decision-making process to decrease operation loss and maximize operation recovery and activity following any disaster that may occur at any time [3].

During a disaster, the supply chain in an organization may be affected, such as electricity and power supply, transportation, and communications. This can result in the disruption of the supply of medicines and medical equipment to the hospital, which can put the system in a state of helplessness and endanger the treatment process. During the disaster, there may also be a disruption in the computer system which can track the course of treatment for hospitalized patients, especially patients who receive critical treatment in critical departments.

Hospitals must implement a preparedness plan to ensure "Business Continuity" in the vital supply chain for the various hospital facilities; they need to store supplies of medicines and medical devices in a safe and accessible place that will allow them to use compliance during a disaster. A hospital

must include technical information in its "Business Continuity" plans to ensure the ability to access medical history for patients being hospitalized. In case of damage to the facility's storage in the event of catastrophic damage such as earthquakes, rehabilitation time will be longer. An example of readiness for the "Business Continuity" of technological system and information is the Haiti earthquake disaster. Clinics functioned quickly and properly because local cell phone networks and mobile devices had been made part of the readiness plan.

Although the issue of the supply of pharmaceuticals and medical equipment should be under government supervision, different companies and hospitals can use different strategies to reduce the disruption of their functional continuity and supply chain. This is about the acquisition of adequate supplies of drugs and equipment that can be kept in warehouses in case of a disaster. Identifying critical problems in various facilities of the hospital and planning correctly can greatly minimize the damage done to the facility. The hospital should find an alternative product in case the used product is lacking. Healthcare providers need to update governmental bodies about any shortfall expected in the supply of drugs or foreseeable problems in the future product delivery so that the government can take measures to help deliver the product to hospitals, thereby minimizing supply chain disruption [4].

Research Goals

The primary goal of this study is to examine the level of readiness of the medical health system in Israel, which is also referred to as "Business Continuity", by focusing on the Israeli hospitals preparedness, during emergencies, long-term wars, and natural disasters, even pandemics. The hospitals play crucial role in mitigating the impact of these disasters. The goals that the researcher is willing to accomplish from this research are:

- (1) To examine the issue of "Business Continuity" in the Israeli hospitals. The study of "Business Continuity" has evolved over the past years. Many studies around the world have studied this topic on various levels. However, no studies have been conducted on Business Continuity in the Israeli hospitals. This highlights the importance of this study, which aims at examining this issue to expand the knowledge of the hospital staff on this important matter.
- (2) To examine "Staff Readiness", i.e., the preparedness of the staff to cope with emergencies, including the staff's self-confidence in coping with various events of disasters.
- (3) To examine the preparedness of the hospitals in the State of Israel in case of an emergency. The readiness of the Israeli hospitals is very important, especially since, over the years, the State of Israel has been frequently exposed to wars, terrorist attacks, and rocket fires to its home front. Moreover, Israel is at risk of earthquake damage, as it is located

in a dangerous and active geographical location. Thus, there is a high probability that the occurrence of a devastating earthquake is only a matter of time. Due to the aforementioned reasons, it is highly important to assess the readiness of Israeli hospitals and examine their general internal plans and their planned methods of dealing with various events of disasters.

Research Questions

- (1) To what extent is the Israeli hospitals prepared for coping with long term emergencies and disasters?
- (2) Are there "Business Continuity" plans for the hospitals?
- (3) In which ways do hospitals prepare their staff for emergencies? What kind of drills do they utilize? How often are they executed?
- (4) What are the plans to develop good "Business Continuity" plans for the critical systems?
- (5) Do hospitals have backup plans (Plan B) in case of the total damage to hospital buildings?

Research Hypotheses:

- (1) All hospitals have a set plan for coping with emergency cases, according to emergency directors.
- (2) There are discrepancies between the degree of preparedness in different hospitals in coping and dealing with emergencies. These discrepancies can be the result of the following cases:
 - (a) Hospital size – Large hospitals are more prepared to cope with emergencies than medium and small hospitals;
 - (b) Previous experience – hospitals that have previously witnessed emergencies, e.g., wars and terrorist attacks, are more prepared than inexperienced hospitals.
- (3) A. Hospital staff (nurses and physicians) will report that they are less prepared to cope with emergencies than what is set in the hospital's general preparedness plan (according to reports of emergency directors).
(3b) There is a positive correlation between the role seniority of the hospital staff (physicians and nurses) and their preparedness to cope with emergencies ("Business Continuity"); higher seniority is associated with better preparedness, and vice versa.
- (4) There is a difference between the level of preparedness of physicians and the level of preparedness of nurses in coping with emergencies; as physicians are better prepared than nurses.
- (5) There is a difference between the level of preparedness of an emergency room in hospitals and the level of preparedness of the other departments of that same hospital; emergency rooms are better prepared than the other departments, according to staff reports.

Research design and procedures

This research was conducted using the mixed methods approaches. First quantitative (questionnaires), and second qualitative (interviews). Mixed method research is a useful strategy to have a more complete understanding of research problems and questions, such as the following: Comparing different perspectives drawn from quantitative and qualitative data; Developing a more complete understanding of changes needed in a specific context, phenomenon, group, organization, etc. through the combination conclusions based on qualitative and quantitative data (Creswell, 2014) [5].

During the first phase of the study, the quantitative phase, the researcher developed a questionnaire and submitted it to the

staff (nurses and physicians) of ten different hospitals in Israel, and the WHO questionnaire was administered to the emergency directors. From each department, ten staff members were randomly selected, five nurses and five physicians (nursing students and medical students were excluded from the study). The emergency directors received an electronic questionnaire and the staff's questionnaires were distributed during the morning, evening, and night shifts in a paper form. After completing the data analysis process, interviews were scheduled with each of the emergency managers, in the second phase of the study, which is the qualitative phase.

Research procedure

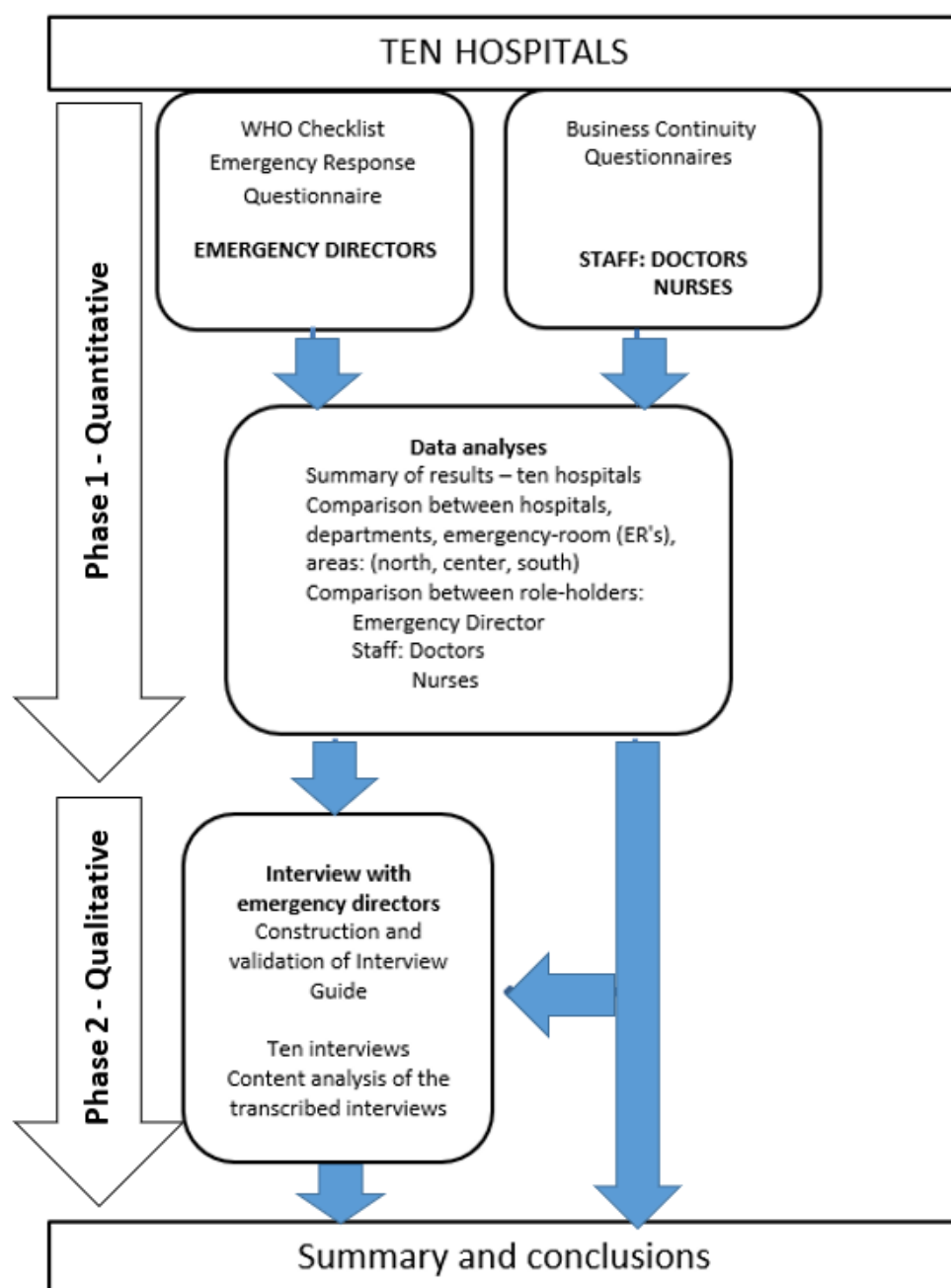


Figure 1. Research Procedures

Research Population and Sample

The characteristics of the participating hospitals are summarized in Table 1:

Table 1. Hospitals Characteristics

No.	Location	Size	Experience with Emergencies	Number of beds	Staff (Physicians & Nurses)
1	Center	Large	Has experience	1134	P-870 N-1720
2	North	Small	No experience	140	P-86 N-112
3	North	Large	Has experience	529	P-510 N-712
4	North	Small	No experience	121	P-117 N-199
5	Center	Small	No experience	330	P-241 N-530
6	North	Small	No experience	119	P-90 N-185
7	North	Large	Has experience	722	P-401 N-985
8	South	Large	Has experience	745	P-743 N-1057
9	South	Large	Has experience	1063	P-934 N-1824
10	Center	Large	Has experience	510	P-384 N-767

From each of the participating hospitals, only departments that provide critical medical care were selected for the study. These departments are referred to in this study as "critical departments" in which "Business Continuity" might be affected in a manner that will endanger the continuity of care provided to the patients receiving vital and critical care during disasters. Examples of such departments include general and pediatric intensive care units, general and pediatric

emergency rooms, operating rooms, gynecology, oncology, orthopedics, dialysis, and cardiology unit.

Emergency directors, physicians, and nurses from ten hospitals and medical centers (six big $n = 454$ and four small $n = 211$) participated in the study. The sample included: ten emergency directors, 330 physicians, and 335 nurses responded to the questionnaires ($N = 665$). The distribution of respondents by the size of the hospital, region, and previous experience is presented in Table 2.

Table 2. Distribution of Staff by Role and Hospital Size, Region and Previous Experience

Role:	Nurse ($n = 335$)	Physician ($n = 330$)	Total ($N = 665$)
Hospital size:			
Small (4 hospitals)	105 49.8%	106 50.2%	211 100.0%
Large (6 hospitals)	230 50.7%	224 49.3%	454 100.0%
Region:			
North (5 hospitals)	150 50.0%	150 50.0%	300 100.0%
Center (3 hospitals)	118 50.4%	116 49.6%	234 100.0%
South (2 hospitals)	67 51.1%	64 48.9%	131 100.0%
Previous experience with emergencies:			
No experience (4 hospitals)	105 49.8%	106 50.2%	211 100.0%

Role:	Nurse (n = 335)	Physician (n = 330)	Total (N = 665)
Has experience (6 hospitals)	230 50.7%	224 49.3%	454 100.0%

The distribution of the staff by the department is presented in Figure 2:

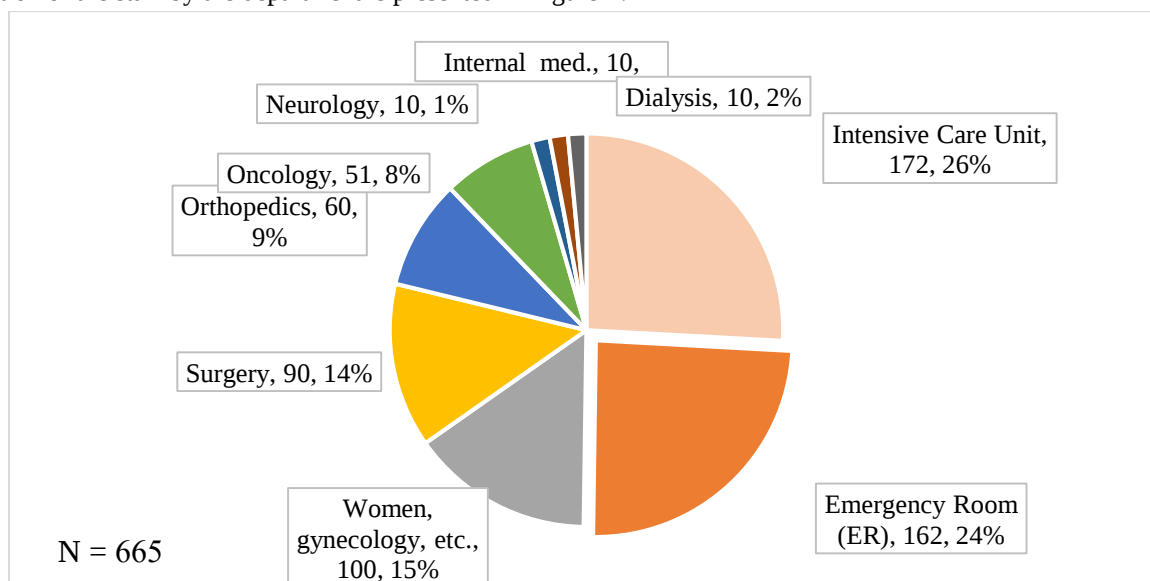


Figure 2. Distribution of Staff by Department

Ethics

The questionnaires were distributed in two methods; by hand and through an online questioner. The staff questionnaire was distributed manually in the field, to each of the participating hospitals' wards. The details of the participants were kept confidential, and the participants were not requested to provide any personal details (such as their first name or contact details).

The Emergency Management questionnaire was distributed as an on-line questionnaire to each of the ten hospitals' Emergency Directors. The respondents' details were kept confidential, and only the researcher read their responses and was exposed to the data that was produced from them. The process of statistical analysis was carried out without any identifying information. Emergency Directors (representing each hospital) and staff were assigned serial numbers (i.e., the identity of the hospitals and staff were referred to only by their serial numbers). Participants were requested to state that they are aware that their participation in the survey is voluntary (not mandatory) and that they may stop filling the questionnaire at any stage.

It was agreed with the hospitals' administrations that the anonymity of the hospitals will be protected and that the research will only refer to the area in which the hospitals are located (north, center, or south of Israel) and their size (small or big).

Finding

According to the results, generally, the hospitals in Israel are in "good" prepared stage. This finding has supported the answers provided for the WHO emergency response

checklist, and according to the ED reports for each hospital. There was a difference in the level of preparedness between the ten hospitals, not all the hospitals completed the recommended actions according to the WHO checklist (hypotheses one). The study shows some gaps between the level of preparedness in large hospitals and small hospitals, and it is important to note the ten hospitals are all working according to the instructions of the Ministry of Health and under its supervision. The mean percentage of preparedness is 81% for the ten hospitals.

The study showed that the hospitals perform drills and simulations for the staff using different scenarios according to some defined protocols, and in coordination with the Ministry of Health, and cooperation with the home front command army. A hospital's resilience would not be complete with hospital watching activities only, however, it must be combined with lectures, experience-sharing among the hospital's workforce, and simulation exercises to empower good hospital preparation, physical preparedness, and develop the environment of the hospital [6], which is also known as the hospitals' 136 readiness for emergencies. In the categories related to the Business Continuity plan (according to the emergency directors' reports and using WHO checklist tool), for example; maintaining critical systems, logistics, communications, supplies, and equipment, in general, the ten hospitals got a "good" grade in terms of their preparedness. In other categories that referred to the same issue of business continuity planning, the hospitals get low grades in preparedness, for example; command and control, post-disaster recovery, and human resources categories. Hospitals

are considered front line responders to crises; the public has expectations that hospitals will provide compassion, care, safety, and support for survivors of community-based disasters [7]. Preparations and high-level organization are essential to coordinate the multiple support systems required for a response effort that provides essentials such as food, water, shelter, medical care, sanitation, and safety. Preparations include real-time development of a command-and-control structure; effective planning that keeps ahead of the unfolding disaster, logistic and transportation support, and security for both the persons affected by the disaster and the responders [8].

In this current study, the highest level of preparedness (according to the emergency director's report) among the nine categories was in the "Triage" preparedness, and the lowest was in the "Human Resources" category. Triage is one of the effective management systems of major emergencies. The process of triage allows the respondents to disasters to prioritize care services. There are many types of triage systems in the world, however, there is no general or universal consensus on how triage should be performed, and the most effective triage is a method that is easy for staff to perform [9].

In general, the results collected during the research give us a general view about the preparedness of Israeli hospitals, which is good preparedness, but this is not enough for a country like Israel, with many challenges in the area, including natural disasters. In case of a national emergency, the hospitals will be under high pressure and chaos. Thus, hospitals must sustain their selves to continue functioning and improve the continuity of care for the hospitalized patients and the wounded arriving from the affected zone. Hospitals must improve their preparedness; the Ministry of Health must increase the number of staff (nurses and physicians) in hospitals, to reduce the pressure on the hospital staff resulting from long work hours.

According to the questioners, the ten participating hospitals showed good results in many fields, including maintaining the critical systems at the hospitals. In each hospital, the general manager needs to renew their protocols related to post-disaster recovery, to reduce the functionality, minimize the resulting damage, and be able to return as soon as possible to their routine work protocols. In the category of "safety and security", the emergency director's office, including all the staff members who are in charge of the subject of emergency and the hospitals' security departments, need to update their protocols and improve their hospital's infrastructure. In this regard, this study suggests that the emergency directors' offices involve the local police departments in this issue.

According to hypothesis 2a, the current study examines the difference between large hospitals and small hospitals. The study assumed that large hospitals are better prepared than small hospitals. According to the ED's answers, there is no significant difference in the level of preparedness according to the hospital's size ($p=.038$), except in the category of

"safety and security", where small hospitals are on average above "in progress" (mean=.64) while large hospitals are closer to being "complete" (mean=.92). According to the staff's report, significant differences were found in three categories, which are "Communication", "Safety and security", and "Surge and capacity". Large hospitals in Israel are large medical centers, and there is a significant difference between large and small hospitals in Israel in terms of their budgets and the size of the workforce in each type of hospital. Despite these differences in budget and workforce, the results shown from the data collected through the questioners are not consistent with the assumption that the large medical center in Israel are prepared for emergencies, and these results are built on existing evidence. The preparedness was similar between the large and the small hospitals. In the categories of surge capacity, human resources, logistical and supply management it was expected to see significant differences between the two groups; large hospitals are expected to manage their resources according to a yearly budget, but in fact and according to the findings, this research shows that there are serious gaps in the healthcare system in Israel.

According to hypothesis 2b, the study assumed that hospitals that have previously experienced emergencies, e.g., wars and terrorist attacks, are more prepared than hospitals with no previous experience. According to the finding, generally, previous experience with emergencies does not play a role in the preparedness of a hospital. This finding is contrary to the initial hypothesis. Hospitals in Israel have witnessed the highest rates of terror attacks in the world, including war and missile attacks at the home front. This study shows that Israeli hospitals with previous experiences with emergencies did not take any steps towards better preparing themselves for future emergencies.

According to hypotheses 3a, the results indicate that differences exist between the hospitals' preparedness to cope with emergencies, and the staff's readiness, according to the answers of the EDs and the staffs (physicians and nurses). In Shanghai, China, it was reported that merely 3.4% of the medical staff participants rated themselves as good regarding disaster medicine knowledge while 62.9% and 31.4% of the participants rated it as moderate and little. Another cross-sectional study in Johannesburg Hospital in South Africa also revealed that 92% of the study participants knew what a disaster is but only 62.5% knew what disaster preparedness is [10].

These studies showed there is a difference between the knowledge (the theoretical knowledge) to the physical ability of the staff to respond to an emergency. On average, the preparedness of the Israeli hospitals to cope with emergencies, Business Continuity, was reported by emergency directors as close to completion, but by staff as only partially completed. These results contradict the reports of the EDs about the general preparedness of the hospital, by setting an internal preparedness plan, including drills for the hospital staff, and prepare the critical systems of the hospital.

According to this current study, the findings of the staff's reports are not consistent with the ED's reports, these results should be considered when looking into the importance of performing drills and exercises and raising awareness and knowledge on the subject of "Business Continuity", and the critical systems in the hospital by the staff members.

The current study examines the difference between role seniority of physicians and nurses (according to hypotheses 3b). According to hypotheses 3b, the findings showed a relatively low correlation between the two groups, the data showed a positive correlation in high seniority and coping with emergencies among nurses and physicians. Despite this finding, the researcher expected a high correlation between high seniority and low seniority. Staff members with high seniority (taking into account the number of their years in the role) are expected to perform more drills, including knowing the protocols of their department and the general internal hospital protocol. As known, each department in Israeli hospitals has two kinds of protocols; first the internal department specific protocols (according to the department specialization), and second, the general hospital internal protocols (applies to all departments). Every staff member needs to read the protocols, and after finish reading need to sign as done, this procedure can give the staff member with high seniority more ability and information, and it makes it easy for them to understand the protocols more than the younger staff for their first reading for these protocols. Another important issue is that staff members with high

seniority are expected to be more self-confident than the younger staff with low seniority to cope with emergencies after many years working and dealing with different situations.

The differences between nurses and physicians according to the Business Continuity original tool are small and not significant, (hypothesis 4). The only significant difference was in one category "continuity of essential services". Nurses were found to be slightly more prepared than physicians. The reason behind this difference might that nurses are more aware and exposed to details about their departments' capacities and the availability of medical equipment, as part of their daily work routine.

Preparedness and training should be made available through continuous education; it also should become a component of both medical and nursing school curricula. According to the findings extracted from the staff report (Business continuity original tool), there was no difference in preparedness between the emergency room department and the other hospital's wards (hypothesis 5). Emergency rooms play a central role in addressing the health impacts of casualties incidents. Emergency rooms are the first line for responding to emergencies and play an important role in saving the lives of those affected by the incident. According to the staff's reports, the difference between the level of preparedness of the emergency room and the other wards in the same hospital is not significant. All wards are only partially prepared.

Table 3. Each Hospital's Preparedness to Cope with Emergencies (Business Continuity) according to emergency directors and staff

Hospital Size Hospital Number		Small								Big											
		2		4		5		6		1		10		3		7		8		9	
		E D	st af f	E D	st af f	E D	st af f	E D	st af f	E D	st af f	E D	st af f	E D	st af f	E D	st af f	E D	st af f	E D	st af f
Mean Business Continuity	.45	.49	.84	.58	.82	.44	.74	.52	.86	.38	.87	.62	.98	.50	.61	.59	.93	.46	.99	.45	
1. Command and control	.29	.60	.86	.67	.93	.54	.79	.52	1.00	.43	.71	.70	1.00	.55	.29	.61	.71	.41	1.00	.50	
2. Communication	.33	.73	.89	.90	.78	.65	.83	.76	.89	.77	.83	.79	.94	.91	.66	.81	1.00	.81	1.00	.92	
3. Safety and security	.35	.44	.60	.51	.75	.31	.85	.54	.85	.40	.95	.59	1.00	.60	.78	.58	1.00	.45	1.00	.45	
4. Triage	.78	.18	1.00	.42	.94	.29	1.00	.40	.83	.22	1.00	.36	1.00	.31	.85	.51	1.00	.33	1.00	.28	
5. Surge capacity	.56	.66	1.00	.74	.69	.63	.56	.68	1.00	.69	1.00	.86	1.00	.74	.69	.79	1.00	.66	1.00	.99	
6. Continuity of essential services	.79	.51	1.00	.53	.86	.43	.71	.51	.93	.34	.79	.63	1.00	.47	.75	.51	1.00	.45	1.00	.41	

ED = emergency director, N = 10, Range: 0 = pending review, 0.5 = in progress, 1 = completed (high preparedness)

Staff, N = 665, Range: 0 = no, 0.5 = partially, 1 = yes (high preparedness)

Table 4. Hospitals' Preparedness to Cope with Emergencies – According to Staff (Mean Categories and Each Item)

	All Staff				Nurses				Physicians				χ^2	d f	sig
	N	0 = No	0.5 = Partially	1 = Yes	N	0 = No	0.5 = Partially	1 = Yes	N	0 = No	0.5 = Partially	1 = Yes			
1. Command and Control	659	Mean = .56	SD = .30		334	Mean = .56	SD = .29		330	Mean = .49	SD = .25				
3. Is there a staff member in charge of the management of emergencies?	487	23.4 %	6.6 %	70.0 %	252	31.0 %	4.8 %	64.3 %	235	15.3 %	8.5 %	76.2 %	18.12	2	.000
4. Does the department have accessible information about preparedness for emergencies?	587	8.5 %	24.2 %	67.3 %	308	9.1 %	20.5 %	70.5 %	279	7.9 %	28.3 %	63.8 %	4.95	2	.084
5. Have you participated in exercises including simulations of business continuity?	642	41.1 %	19.9 %	38.9 %	325	42.2 %	21.5 %	36.3 %	317	40.1 %	18.3 %	41.6 %	2.19	2	.334
10. Do you know if there is a plan for continuity of treatment for patients in emergencies?	511	23.1 %	23.5 %	53.4 %	262	22.1 %	25.6 %	52.3 %	249	24.1 %	21.3 %	54.6 %	1.34	2	.511
16. Are there any copies of all the necessary documents and records available for manual work?	524	12.6 %	31.7 %	55.7 %	274	13.5 %	27.4 %	59.1 %	250	11.6 %	36.4 %	52.0 %	4.93	2	.085
2. Communication	545	Mean = .81	SD = .34		284	Mean = .82	SD = .34		261	Mean = .80	SD = .34				
15. Do you know if there is a specific method for communicating with the staff in emergencies?	545	11.4 %	15.0 %	73.6 %	284	11.6 %	13.0 %	75.4 %	261	11.1 %	17.2 %	71.6 %	1.89	2	.389
3. Safety and Security	618	Mean = .48	SD = .28		317	Mean = .49	SD = .29		301	Mean = .47	SD = .27				
9. Do you recognize risks and threats to treatment continuity for patients in the event of an emergency?	594	11.4 %	27.4 %	61.1 %	308	13.6 %	25.3 %	61.0 %	286	9.1 %	29.7 %	61.2 %	3.75	2	.153
11. Is there a documented strategy for implementing a plan to maintain the "Business	436	27.1 %	30.0 %	42.9 %	229	27.1 %	29.7 %	43.2 %	207	27.1 %	30.4 %	42.5 %	0.03	2	.984

	All Staff				Nurses				Physicians				χ^2	d f	sig
	N	0 = No	0.5 = Partially	1 = Yes	N	0 = No	0.5 = Partially	1 = Yes	N	0 = No	0.5 = Partially	1 = Yes			
Continuity" of the department?															
13. Is the alternative place safe and suitable for work?	410	44.4 %	18.8 %	36.8 %	214	41.6 %	20.6 %	37.9 %	196	47.4 %	16.8 %	35.7 %	1.68	2	.433

Staff Finding: Preparedness

Overall, the findings from the staff Business Continuity questionnaire report were not encouraging. It revealed the gaps between the hospital's internal plan preparedness and staff's readiness. As an example of critical worrying findings, 42% of all nurses, and 40% of all the physicians reported that they did not participate in any exercises, including simulations. Only 36% of nurses and 42% of physicians reported that they have participated in such exercises. The reason behind this finding is the different shifts in which the staff work; in Israel, hospitals perform drills during morning shifts only, and they did not take into account the other shifts (evening and night shifts) and the other personnel working during the weekends.

Only 52% of the staff (nurses and physicians) know if there is a plan for continuity of treatment for patients during emergencies. 61% of all the staff members in the critical departments reported that they recognize risks and threats related to treatment continuity in the event of an emergency. Only 41% of the nurses and 40% physicians reported that they are aware of the issue of business continuity, and only half of the staff members (nurses and physicians) know the critical systems of their department. In parallel with their reports, the ED's results in the category of continuity of essential services were high (mean=88).

Moreover, 42% of the nurses and 47% of the physicians reported that there is no safe and suitable alternative place for work, while 8% of nurses and 36% of physicians reported yes. In agreement with the staff's input, the EDs' reports in category safety and security the recommended action get a high score (mean=81).

Regarding the readiness to cope in cases of emergency, 68% of all nurses, as well as 67% of the physicians reported they do not have the self-confidence and readiness to cope with emergencies. The ED's report in the category of triage was excellent (mean=94). This finding regarding self-confidence is related to the implementation of drills and simulations. hospital's staff and delegate and assign roles. The lack of such information can put the hospital in a position of chaos and loss of control.

According to other studies from all around the world, conducting more drills can improve the staff's response to an emergency. Improving staff response means increasing the knowledge and the self-confidence of the staff.

Interviews Finding

To make this study more comprehensive and of the higher benefit, the researcher, after collecting the research data and summarizing the results, conducted face-to-face interviews with the ten hospitals' emergency directors. There are two main objectives for conducting the interviews; first, to examine the ED's general information about his/her hospital's capacity. Second, to show the EDs the final findings collected through the hospital staff's reports. The ED of each hospital needed to explain the results (the gaps between his/her report and the staff reports). Moreover, the researcher asked the EDs about their opinions about these results, and their ideas on how such issues can be improved. Regarding the first part of the interview, the provided answers were not satisfactory. The Emergency Directors at the participating hospitals were not able to provide satisfactory answers due to the lack of knowledge. EDs, as part of their important role, to know the capacity of their hospitals in routine situations and emergencies, including the number of beds, extra beds if needed, number of wounded that the emergency room can receive, number of the operation rooms, number of operations the hospitals can perform every day and the number of the departments that can be evacuated in case of emergency. Emergency Directors must possess this information about their hospitals' capacity, thus, in case of emergency, they need this information to coordinate the first emergency response while receiving the wounded from the affected zone, and to manage the emergency with the hospital management, including coordinating with the hospital staff and other emergency responses. The ED of each hospital must direct the related

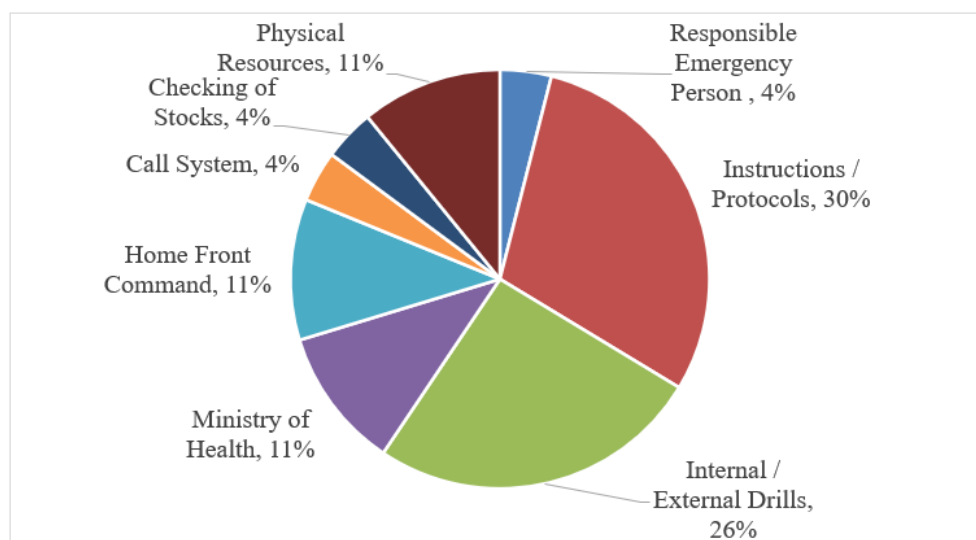


Figure 3. Preparations for handling emergencies by hospitals, according to ED's answers.

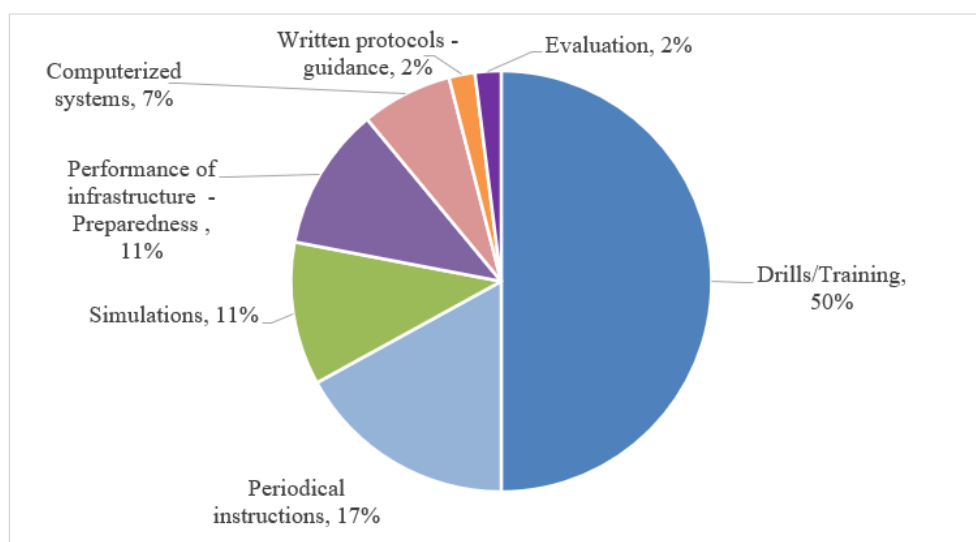


Figure 4. Methods of drills or simulations, according to ED's answers.

In the second part of the interview, EDs were asked to comment on the final result each 149 for the hospital in which he/she works, after the researcher showed them the results. The most recurring answers among the EDs were that the staff is not trained and not instructed on the subject of business continuity, young staff, relatively new, inexperienced staff, and workers on different shifts. According to the EDs, the The second question in the interview was if their hospitals were ready for emergencies and if they can handle emergencies according to the staff results. 42% of the ten EDs (large hospitals) reported that they are 80% prepared for emergencies. As for the remaining EDs, some of them answered "I agree more" on some subjects and "I agree less" on other subjects. The situation in the small hospitals was not good, according to the ED (expect hospital number 5) reported low preparedness, and some are not ready at all. The final question to the EDs was about what can be improved and how? The answers received from all EDs

research findings are very interesting. EDs of most participating hospitals, both large and small hospitals, accepted the results and respected the staff's reports. All EDs were willing to consider the results, to learn from them, and to use them in the preparation of their next internal drills. The EDs considered the results as true and reflective of the reality of the whole Israeli healthcare system. summarize all the gaps found in the Israeli healthcare system, and such gaps are similar in every hospital in Israel. These gaps lead to many years of nurses and physicians strikes and protests in the hope to improve the healthcare system in the country. According to the EDs, the most areas in need of improvement are the number of medical staff (nurses and physicians), i.e., increasing manpower, performing more drills and simulations, and allocating more budgets for the healthcare system.

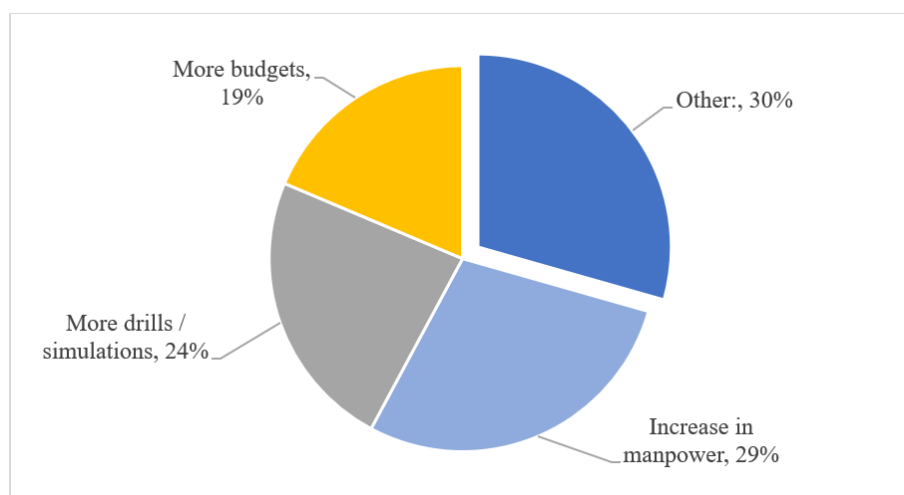


Figure 5. Ways to improve preparedness, according to ED's answers.

Table 5. Current business continuity plan

(P1-1) Do you currently have a business continuity plan at your hospital?	f
YES	7
Yes – but the interviewee is not aware of it	1
Yes – but partially	1
NO	2
Yes / No - according to the regulations of the Ministry of Health	2

N=10

NOTE: f = frequency of responses within the answers of the ten interviewees.

Table 6. General backup plan

(P1-2) Does your hospital have a general backup plan?	f	%
Yes	5	50%
No	2	20%
Partially	3	30%
Please specify		
Solar Energy, Gas, Electricity, Fuel/ Diesel, Water, Oxygen, And Food	26	72%
Reserve Equipment	5	14%
Emergency Hospital	2	6%
Workforce, Management of Workers	1	3%
Transportation for Workers	1	3%
Residential Kindergarten for The Workers'	1	3%

N = 10, F = 36

NOTE: f = frequency of responses within the answers of the ten interviewees

Table 7. Handling emergencies

(P1-3) How does your hospital handle emergencies? (Please give me some examples).	f	%
A Person Who Is Responsible for the Subject of Emergency	1	4%
Guidance Instructions / Protocols for Staff +Computer-Based Instructions	8	30%
Internal / External Emergency Drills / Exercise	7	26%
Involving the Ministry of Health	3	11%
Involving Home Front Command	3	11%
Computerized Global Call System by for Calling Critical Staff	1	4%
Checking of Stocks and Viability of Equipment and Medicines	1	4%
Physical Resources: Alternative Areas for Hospitalization / Shelters for Those Wounded / Daycare for Children	3	11%

F = 27

NOTE: f = frequency of responses within the answers of the ten interviewees.

Table 8. Methods of drills or simulations (frequency)

(P1-4) What methods of drills or Simulations do you use in your hospital, and how often?		
Periodical instructions	8	17%
Drills / Training	23	50%
Simulations	5	11%
Written protocols / guidance	1	2%
Performance of infrastructure /Preparedness check Automatic call to team members	5	11%
Computerized system / tests	3	7%
Evaluation (observers, checklists)	1	2%

$F = 46$

NOTE: f = frequency of responses within the answers of the ten interviewees.

Table 9. Mass casualty event – wounded

(P1-6) How many wounded can your hospital receive during a mass casualty event?		# of wounded
average		104
Minimum		24
Maximum		280
# of respondents		7

$N = 10$

NOTE: f = frequency of responses within the answers of the ten interviewees.

Table 10. Extra beds

(P1-7) How many extra beds can the hospital arrange for in an emergency?	# extra beds	No approval	Total hospital's general occupancy	I don't know
average	317			
Minimum	24			
Maximum	1,200			
# of respondents	7	1	1	1

$N = 10$

Table 11. Evacuation plan

(P1-8) Do you have an evacuation plan? (Does it include facilities or departments? Which departments?)	f	%
Emergency hospital / all departments to the underground hospital	3	21%
Specific wards: ear, nose, and throat ward/eye ward/ Skincare / internal medicine	3	21%
Use an emergency room	3	21%
Open up operating rooms	2	14%
Outpatient / day hospitalization/ clinics	3	21%

$F = 14$

NOTE: f = frequency of each theme in the answers of the ten interviewees.

NOTE: The percentage indicates the occurrence of each theme out of the 14 themes – therefore, the sum on percentages does not add up to 100%.

Table 12. Explanations and reasons for hospitals' results

(P-2 1) How can you explain these results ?	f	%
What are the reasons for these results in your opinion?		
Team members know their job	1	5%
Team members know their department	1	5%
Knowledge varies between staff	1	5%
Depend on external experts: In a state of emergency, we call for reinforcement and experienced staff	1	5%
It is interesting and the interviewee is curious about the results	2	11%

young, relatively new, inexperienced staff; workers on different shifts	4	21%
no defined role as emergency manager	1	5%
the staff is not trained and not instructed on the subject of business continuity	5	26%
different shifts	2	11%
Infrastructure not adequate	1	5%

$F = 19$

Table 13. Ready for emergencies according to results?

(P-2 2) According to your hospital's final results, do you think that you are ready for emergencies? Can you handle emergencies?	f	%
Overall – Prepared – up till 80%	5	42%
On some subjects, I agree more and on other subjects, I agree less	1	8%
the hospital relies on the Home Front Command	1	8%
Very low	1	8%
Not prepared	1	8%
I do not think that in our hospital the results will be different from anywhere in the State of Israel	1	8%

$N = 10$

Table 14. What can be improved

(P-2 3) If the hospital is not ready or partially ready, what can be improved? And how?		
Increase in manpower	29%	6
More drills/ simulations	24%	5
More budgets	19%	4
Other:	30%	
Increase involvement of management	5%	1
Increase involvement of minis. of health	5%	1
the orientation of new personnel	5%	1
Increase involvement of the home front command	5%	1
Its national problem	5%	1
regional forces for a common drill such as ambulance services police fire and rescue squads	5%	1

$F = 21$

Recommendations and Suggestions

To maintain the functionality in hospitals, including the Business continuity plan and the care continuity for patients,

new plans must be established, with a revamp for all existing protocols. In this study, the researcher suggests and presents a new model for business continuity, which is the "The Chain Survival Model":

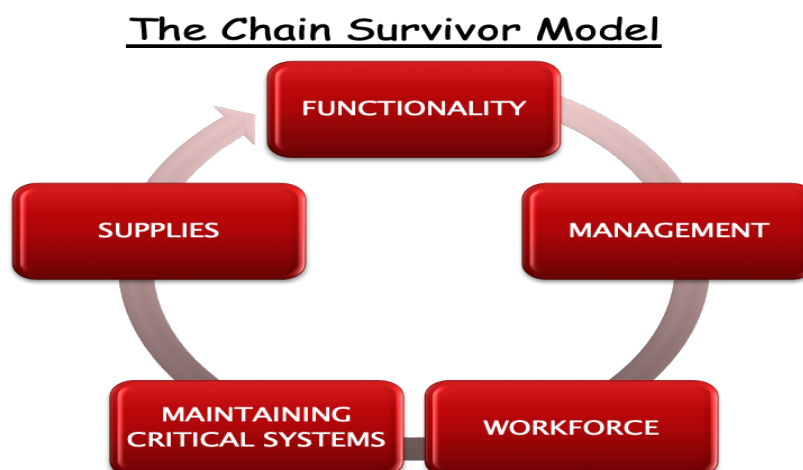


Figure 6. The Chain Survivor Cycle.

- 1- **Management:** Management is essential for organized work and necessary to run all types of management. Good management is the backbone of successful organizations and continuity of operations. Managing an organization or hospital means getting things done from the top down with and through other people to achieve its objectives, updating plans and training. During emergencies, key staff members in an organization play an important role in maintaining continuity of operation, which is in providing instructions to employees, making decisions, and sharing roles. Management should also provide safety environment, including motivation in case of emergency.
- 2- **Workforce:** Workforce management includes the effective staffing, forecasting, scheduling, and real-time adjustments required for the hospitals to be as efficient as possible. The objective of workforce management is to get the right number of personnel and the right roles, in the right place at the right time, doing the right tasks with the sufficient amount of skill, knowledge, and experience required to achieve its strategic objectives.
- 3- **Maintaining critical systems:** critical systems are systems whose failure might result in injuries, loss of lives, or serious environmental damage. Monitoring critical systems are very important in a hospital. The most hospital critical systems are electricity, gas, and IT systems.
- 4- **Supplies:** Healthcare facilities, hospitals, assisted living facilities, hospices, and similar establishments must have a contingency plan in place in the event of a natural disaster or other crisis. Hospitals should provide critical supplies for both patients and employees in case of emergencies, such as water, food, medicine, and medical equipment. Hospitals should test their ability so that they can provide the equipment for days, even for weeks. If a hospital cannot provide basic items such as food and water, it should be evacuated.
When disaster strikes, healthcare facilities must have a response plan that includes enough food for the patients and the employees.

During water system interruptions, the operation of health care facilities is severely interrupted and its capability can be extremely degraded within two hours. To maintain daily operations and patient care services, healthcare facilities need to develop a water supply plan in advance of an emergency. Several types of events, such as a natural disaster, a failure of the community water system, construction damage, or even an act of terrorism can cause water supply interruption.

Any interruptions in management by taking a wrong decision, or due to lack of human resources, power outages, and lack in supplies, this chain will be broken. To maintain the survival chain and improve "Business Continuity" in the healthcare system, first, all stakeholders must have a response plan for an emergency by conducting exercises and simulations at least twice a year. The exercises should include all hospital facilities including all staff. Exercises should be required for all staff so that everyone can participate. Exercises are supposed to be not only during the daylight but also at night. Exercises must be designed to give the team the ability to deal with similar events of natural disasters, such as extreme weather or earthquakes, human-made disasters, whether it is an industrial disaster with multicausality, terrorist attacks, or modern war event.

During exercises, the team should gain knowledge and the ability to deal with various disasters. Exercises are also intended to provide a snapshot for management on staff readiness, hospital capacity, gaps and to resolve the problems encountered before the disaster occurs. Exercises give staff the ability to know their specific roles in an emergency, and how to respond using the existing emergency response protocols, and how to deal with the critical systems of each department. Practices and knowledge are the cornerstones of team readiness. Exercises increase knowledge, and knowledgeable staff will be prepared and confident of their ability to face various emergency events.

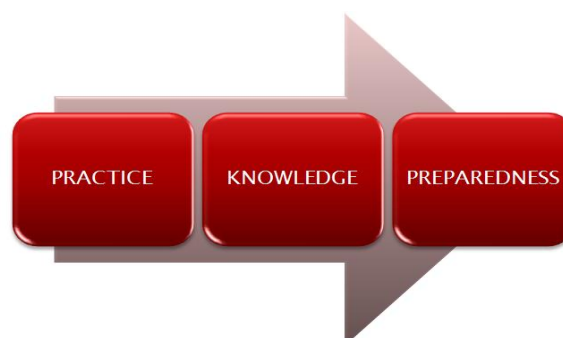


Figure 7. Gaining preparedness by providing knowledge through practice

Research Limitations

This study included ten public Hospitals out of the total 23 public hospitals in Israel. A national survey including all 23 hospitals in Israel might show more specific findings.

The Israeli National Emergency Department refused to take part and cooperate in this study. In case it agreed to participate, the Israeli National Emergency Department could have made all the hospitals participate in this study, which would have resulted in more comprehensive results.

During the data collection process, all questionnaires were distributed by the researcher himself to the participating staff of all the ten hospitals, without any cooperation from the hospitals' management or the department managers. Cooperation by the management could have increased the seriousness and level of responsibility among the staff in answering the questioners. This can maybe show different findings.

CONCLUSIONS

The major conclusion to this study was that the hospitals in Israel (10 Hospitals) is in good stage of preparation. The study showed some gaps between the level of preparedness in large hospitals and small hospitals in favor of the large hospitals. The study showed that all the hospitals participated in the research perform the required drills and simulations for the staff using different scenarios according to protocols. In general, all the ten hospitals received a "good" grad in terms of their preparedness, in the categories that refer to the Business Continuity Plan (i.e., maintaining critical systems, logistic, communications, supplies and equipment). However, most of all the hospitals received low grades in preparedness in some particular categories (e.g., "command and control"). This study found that the highest level in preparedness among the ten hospitals was in the "Triage" category, and the lowest level was in "Human resources" category.

In general, this study refutes the assumption that large hospitals are more prepared than small hospitals. This study also showed that there is no significant differences between large hospitals and small hospital in Israel, accept in the following categories of "Communication", "Safety and security", and "Surge and capacity", according to the emergency directors and the staff report. Further, this study refutes the assumption that hospitals with previous experience in emergency are better prepared that hospital without previous experience. Another important finding of this study is that there is significant different between hospitals' level of preparation, and the degree of staff self-readiness.

The study also found difference between the insufficient knowledge of the staff and the proper physical ability of the staff to respond to an emergency.

This study found lack of knowledge among most of the emergency directors, and low general information concerning their hospitals, in addition, and according to the ED's interviews finding, this study showed there was no general alternative plan in most of the ten hospitals in case of total damage. Also, the study showed that in Israel the medical staff is not trained and not instructed on the subject of Business Continuity. According to the findings, the Israeli healthcare system in general has serious shortage in medical staffs and suffers from low budget.

Despite the unsatisfactory preparedness findings among the hospitals staff and emergency directors, the internal hospital readiness is indeed good. The study indicates that there is great importance in using other methods that will enable all hospital staff to participate in the drills and recruiting more medical staff.

SUMMARY

- Major conclusion: there is a good level of preparedness in the Israeli hospitals.
- All hospitals perform drills and simulations.
- This study refutes the assumption that large hospitals are more prepared than small hospitals.
- This study refutes the assumption that hospitals with previous experience in emergency are better prepared than hospitals without experience.
- This study shows significant difference between hospitals' level of preparations, and the degree of staff self-readiness.
- This study found lack of knowledge among most of the ED's.
- This study showed that in Israel the medical staff is not trained and not instructed on the subject of Business Continuity.
- This study revealed that the Israeli hospitals in general has serious shortage in medical staffs and suffers from low budget.
- This study showed there was no general alternative plan in most of the ten hospitals in case of total damage.

This study was structured to be a pioneering study in the field of the health care preparedness in Israel, being the first study conducted in Israel in this scope of huge data and large number of hospitals that cooperate in such a study.

Thus, this study can be used as a "Benchmark" for future studies in this field, and hopefully to suggest a change of the

concepts and the standards used in the field of "emergency preparedness".

between the hospital preparedness and the staff-self preparedness, after showing all the results of the staff. In general, all answers were similar to each other and connected to the Israeli Health Care System. Some EDs described the issue as a "national problem" and is the same issue in all hospitals in Israel (Israel has 23 public hospitals across the Country). Additionally, limited budgets, the shortage of human resources (physicians and nurses) are the primary reasons and the most obvious reasons for every healthcare worker in Israel.

The EDs from all participating hospitals accepted the results of the staff questionnaires and respected them. They escalated to results to the hospital management to learn from the results and use them in the planning for the next drills and exercise, to reduce the 129 gaps. Some EDs were not surprised by the results and considered them common and expected. They agreed that the solution is to make more and more drills, involving the Front Home Command, the National Emergency Department, the hospital management, and the Ministry of Health. Moreover, they are planning on developing new plans that involve all hospital workers in the drills or exercises at least once a year, including new workers (physicians and nurses); such make exercises or simulations must become part of their induction process.

Hospitals must maintain business continuity at all times, and since hospitals are considered organizations, they must keep functionality at all levels to ensure their existence and survival during a disaster. "Business Continuity" of hospitals is perceived only in times of emergency. Maintaining "Business Continuity" even in routine functioning is essential. During routine functioning, emergencies can arise throughout the hospital, such as having a fire in one of the hospitals' departments, or any other cases. The discussion regarding emergencies typically refers to national emergencies, such as various natural disasters as mentioned above, and even events caused by acts of humans, such as war and terrorism, conventional and unconventional events.

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