Disaster Preparedness in Jordanian Public Hospitals According To the Hospital Safety Index

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Abstract

In 2015, the author of this study conducted three anonymous focus groups with professionals with the aim of strengthening the disaster preparedness of newly built or renovated Jordanian hospitals. The semi-structured questions included: "Will you explain what you know about structural and non-structural standards implemented in public hospitals?" This study was based on the Hospital Safety Index developed by the Pan American Health Organization (PAHO) and World Health Organization (WHO), which has been used for several years by numerous countries to improve their disaster responses. The results indicated that most safety standards were implemented. However, further attention should be given to creating a plan to manage the safety of the physical environment, provide monitored dangerous sites, and improve the hazardous waste disposal process. This study recommends conducting further studies that include all hospitals in Jordan.

Keywords: Focus group discussion, disaster preparedness, public hospital, Jordan

1. Introduction

Jordan, with a population of approximately 6.3 million, has a growth rate of 2.2%, which is one of the highest in the region. The country is now in the midst of a record building boom of health care facilities, with a focus on hospitals. In fact, the Ministry of Health renovated or built 14 hospitals from 2000 to 2012 (Ministry of Health, 2012); to put this into perspective, the Jordanian Ministry of Health operates 31 public hospitals across the Hashemite Kingdom of Jordan, which provide essential healthcare services to all people and contain 4965 beds, constituting 39.2% of the total hospital beds in the nation (Health Sectors in Jordan, 2015). The main drivers for this building boom include the aging of some major hospitals; the growing need to provide high quality and safe healthcare services to the Jordanian population (United Nations Children's Fund, 2014); and the government of Jordan's "Advanced Health System" initiative, which is based on the development of the healthcare system as the entrance to the development of all other sectors (Health Care Initiatives, 2015). However, hospitals around the world are vulnerable to abnormal events, as almost all countries are exposed to a wide variety of unexpected adverse phenomena, either natural or manmade, including terrorist attacks, wars, floods, fires, earthquakes, chemical accidents, and disease outbreaks (Blaikie, Cannon, Davis, & Wisner, 2014).

Jordan is located in a politically unstable region of the Middle East, sharing borders with countries occupied in conflicts and civil wars (Burns & Novelli, 2008; Jordan- Foreign investment Portal, 2015; The World Bank and the Impact of the Syrian Crisis, 2014). Like other countries vulnerable to these types of events, which can lead to negative effects during the normal course of life and disability in the provision of vital services to citizens, one essential and vital service is hospital services (European Hospital and Healthcare Federation, 2013). Thus, Jordan, like other countries around the world, needs to be aware of Jordanian hospitals' ability to continue to provide essential, high quality and safe healthcare services in unexpected circumstances without interruption, which is crucial for their effective functioning (Vincent, 2010). Moreover, all parties must work together to create these strong, safe hospitals (Krause & Hidley, 2009); a safe hospital refers to an institution that remains standing, and can still access and provide health services at full capacity and within the same basic structure in emergency and disaster situations (Pan American Health Organization, 2015). Its aim is to protect the lives of people and ensure hospitals are able to function during and after disasters (Nord, 2009).

However, ensuring the functioning of hospitals and keeping them safe is a challenge when limited data exists regarding the level of safety and preparedness as well as disaster management of hospitals (World Health Organization, 2015). This study will therefore directly tackle these issues by elucidating the complexities surrounding hospital safety; more specifically, it will examine hospitals' preparedness in emergency and disaster situations.

1.1 Objective of the Study

The objective of this study was to review the current situation of disaster preparedness in Jordanian public hospitals and produce recommendations that will serve to strengthen emergency preparedness. This review used the Hospital Safety Index to evaluate the three major public hospitals that have been built or renovated during the last ten years, which constitute 40% of the Ministry of Health's hospitals beds, or 1938 beds.

2. Literature Review

Many tools are used in the literature to evaluate the safety of hospitals (National Fire Protection Association, 2005; World Health Organization, 2008; McNew, 2015), although the Hospital Safety Index is one widely used measure, which has been tested over the last twenty years (Marya, 2011) and used by more than 160 countries worldwide. The Hospital Safety Index was developed by professionals from diverse specializations (Dyro, 2004) and first published by the Pan American Health Organization and World Health Organization in 2008 (Pan American Health Organization , 2008) to evaluate structural and non-structural safety issues in hospitals. The assessment of the structural safety of hospitals includes an assessment of the structure type, design, location, and materials with respect to hazards (Steiner & Butler, 1987), while the assessment of the non-structural safety of hospitals involves an assessment of the contents of a building with respect to hazards (Allemang, Clerck, Niezrecki, & Wicks, 2013). Assessing healthcare facilities' safety (World Health Organization, 2015) can result in significant progress in improving their safety in case of emergencies and disasters.

3. Methods

This qualitative study was designed to explore and gather professionals' views pertaining to the issue of safety in Jordanian hospitals. A method used in this study was face-to-face focus groups, which has become widely used in research (Cooper & Schindler, 2006); this method involves in-depth discussions among small groups of participants in order to obtain detailed accounts of professionals' experiences, knowledge, and viewpoints regarding study issues. In this study, sampling principles were used to select professionals from engineering, management, quality, and maintenance departments. The study data were collected in 2015 after obtaining approval from the Ministry of Health to conduct this study. Each group consisted of six participants (n=18), which is considered to be an appropriate size for focus group interviews (Fern, 2001). Group sessions were conducted in the quality department of each hospital; this site was chosen because it was comfortable and close to all participants. The meetings were held in the morning, and each session lasted between 120 and 160 minutes, which is an acceptable length for this type of study (Zikmund, 2003). Group discussions were tape-recorded and manually transcribed, and participants were asked for their consent before the interviews were recorded.

After participants gave their consent, the author explained the reasons for the meeting and presented the Hospital Safety Index (structural and non-structural standards) that was to be discussed. The author developed and asked 14 semi-structured questions, which were as follows: Will you please tell me what you know about the hospital's: 1) location, 2) design, 3) structures, 4) safety of the roofing, 5) safety of ceilings, 6) safety of doors, 7) electrical system, 8) water supply system, 9) medical gas system, 10) fire suppression system, 11) radiological equipment, 12) laboratory department, 13) emergency rooms, and 14) radiation therapy department, as shown in the tables (1–14). The author's role during the study included ensuring that every participant had the chance to speak, explaining matters that were vague, helping participants to relax, and guiding the discussion when needed in order to achieve the study goal. Thematic pattern analysis was used to analyze the data, which is flexible, reliable, appropriate for handling a relatively large volume of data, and allows for the creation of lists and categories of data (Saldana, 2009). All the data collected was made secure at the author's computer with guaranteed anonymity.

4. Results

The study participants' ages ranged from 31–51 years old; most of them were men (n=15) who were full-time workers with a minimum of five years' work experience. The data collected were coded by group (G1–G3) and by participant (P1–P6).

4.1 Structural Standards

As summarized in Table 1, there is consensus among the participants on the safety of hospitals' location. As one worker in a focus group stated: "When the Jordanian Ministry of Health wants to create a new hospital, there are usually multiple options for site selection."

Table 1: Hospital location (focus group data)

#	Items	FG1	FG2	FG3
1	Located near a cliff	×	×	×
2	Located on a slope	×	×	×
3	Location at risk of flooding	×	×	×
4	Located near the foot of a mountain	×	×	×

Table 2 cover participants' perceptions of hospital design, and participants described the shape of hospitals by their simplicity. As one worker commented: "In some cases, we are using the same construction plans for more than one hospital."The hospitals are all resistant to earthquakes, as the establishment of earthquake-resistant buildings is a legal requirement. The results in Table 2 indicate that the wind resistance of doors and windows is not taken into account, as one worker stated: "In Jordan, we rarely see strong winds that can adversely affect the buildings."Regarding the number of floors in hospitals, which are often over five floors, one worker stated: "We do not have rules for determining the number of floors in hospital buildings."

Table 2: Hospital design (focus group data)

#	Items	FG1	FG2	FG3
5	Has a simple shape	√	√	√
6	Doors and windows are resistant to high wind speeds	×	√	×
7	Is less than five floors	×	×	×
8	Structures are earthquake resistant	√	√	√

Table 3 presents participants' perceptions related to hospital structures, which shows that there is consensus across the aspects covered by this issue. Participants pointed out that the basic building material used in the construction of hospitals is cement, which has good resistance to fire. One participant stated: "In the last two years, we have seen some private hospitals rely on non-cement materials in construction."Participants agree that the construction of these buildings is usually carried out under full supervision, they have not seen cracks in buildings, and ramps are built-in the appropriate and required places. Regarding the width of corridors, they are sufficient and allow the freedom of movement of beds and people.

Table 3: Structures (focus group data)

#	Items	FG1	FG2	FG3
9	Hospital structure screamed with fireproof materials	√	√	√
10	There are no significant structural cracks in hospitals structures	√	√	√
11	Hospitals are built with the right building inspection and control operations	√	√	√
12	Ramps are built-in appropriate places for moving patients and people with disabilities	√	√	√
13	The width of all corridors with frequent bed and trolley movement is not less than 2350 mm	√	√	√
14	The minimum ceiling height is 2700 mm	√	√	√

4.2 Non-structural Standards

A summary of the responses of the three focus groups regarding the safety of the roofing is shown in Table 4. The-roofing materials are fully secured and are leak-proof with adequate drainage systems, but they are not fireproof.

A number of workers responded that every year before the winter season, a roofing assessment is performed and any defects that are discovered are addressed.

Table 4: Safety of hospital roofing (focus group data)

#	Items	FG1	FG2	FG3
15	Roof is leak-proof	√	√	√
16	Roofs has an adequate drainage system	√	√	√
17	Roofing materials are securely fastened and cemented	√	√	√

Table 5 shows participants 'perceptions related to the safety of ceilings, and participants agree that special attention is always paid to the ceilings of buildings. Cracks are rarely detected, and in the case that they are, they are evaluated and treated. Ceiling lights are properly secured; however, one defect that has been noted is that ceilings have not been fireproofed.

Table 5: Safety of ceilings (focus group data)

#	Items	FG1	FG2	FG3
18	Concrete ceilings have no cracks or leaks	√	√	√
19	Ceiling lights are properly secured	√	√	√
20	Ceiling materials have been treated with a fire retardant paint	×	×	×

Issues related to the safety of doors are shown in Table 6. The results show that doors are adequately wide and double swing where required, although they are not all made from fire-resistant materials; as a worker in the maintenance department said: "Fire resistant doors are used in specific locations to form an isolated fire zone."

Table 6: Safety of doors (focus group data)

#	Items	FG1	FG2	FG3
21	Door materials are fire-resistant	×	×	×
22	Doors in rooms are a minimum of 122 cm wide	√	√	√
23	Main doors double swing	√	√	√
24	Fire doors are fire resistant and swing out	√	√	√

Table 7 shows participants' perceptions related to the electrical system. The results indicate the attention of those in charge of the establishment of hospitals in providing stand-by generators of sufficient capacity to supply electricity to all critical areas, protected control panels, and grounded electrical systems with backup batteries and automatic transfer. Automatic fire systems protect the electrical systems, butte main electricity units are usually located in the basements of buildings, where they are at risk from the adverse effects of floods. One participant stated: "The electricity central control sites are located in secure sites, although they are not secure from some events such as flooding."

Table 7: Electrical system (focus group data)

#	Items	FG1	FG2	FG3
25	An emergency generator with the ability to meet the needs of the hospital	√	√	√
26	The location of generators or power plants is protected from natural and manmade disasters	√	×	×
27	Generator with automatic transfer	√	√	√
28	Generator with protected control panel	√	√	√
29	Electrical system is adequately grounded	√	√	√
30	Electrical system protection with automatic fire system	√	√	√
31	Sufficient lighting in all areas of the hospital	√	√	√
32	Emergency lighting back up battery available in all major areas	√	√	√

Table 8 shows participants' perceptions related to the water supply system. Water tanks are located in secure locations, but are not large enough to meet the needs of the hospital for a long period. The water supply systems meet international standards and are protected from any trauma. One participant said: "The hospital must have an overall plan to manage utility systems, including the water and electrical systems, "while another stated: "We will fix the problems when they occur, but we do not have a regular schedule for inspection, testing, and maintenance of the water distribution systems (pumps, pipes, valves, etc.)."

Table 8: Water supply system (focus group data)

#	Items	FG1	FG2	FG3
33	Water reserves are sufficient to meet the needs of the hospital for a three-day span	√	√	×
34	Water tank is installed in a safe location	√	√	√
35	Use of proper pipes to fix ruptures and leaks	√	√	√
36	The water distribution system is free from harmful agents	√	√	√

Table 9 shows participants' perceptions related to the medical gases system. The main storage sites are located in secure, well-ventilated areas and the system has an automatic shut-off device; however, in practice there is no ongoing program to inspect and detect faults before they occur. One participant said: "Medical gas is one of the most critical things to look at in hospitals; in addition, we need a schedule for inspection, maintenance, and repair of the medical gas storage and distribution system."

Table 9: Medical gases system (focus group data)

#	Items	FG1	FG2	FG3
37	Medical gases are kept in a well-ventilated area	√	√	√
38	Medical gases are kept in a secure area	√	√	√
39	Hospital stocks of medical gases can last for seven days	√	√	√
40	Medical gases use standard pipes	√	√	√
41	Medical gases system undergoes regular testing procedures	×	×	×
42	Medical gases system has an automatic shut-off device	√	√	√

Several workers made comments related to the importance of the fire suppression system; Table 10 presents the results of the discussion related to this system. Hospital rooms contain fire, heat, and smoke detectors connected with an automatic fire alarm system that is conducive to both automatic and manual usage. The results indicate an absence of monitoring and control rooms and a clear lack of portable fire extinguishers, as one worker commented: "We need frequent inspections of fire detection and suppression systems in addition to testing of fire protection and abatement systems."

Table 10: Fire suppression system (focus group data)

#	Items	FG1	FG2	FG3
43	Alarm, detection, and extinguishing systems that are connected with an automatic fire alarm system	√	√	√
44	Fire alarm system can be used automatically and manually	√	√	√
45	Fire alarm systems monitored by a fire department or other professional department	×	×	×
46	Hospital has heat and smoke detectors	√	√	√
47	Each room is equipped with a portable fire extinguisher	×	×	×

Table 11 presents a summary of the comments from the focus groups pertaining to X-ray equipment sites. One worker commented that the X-ray equipment is located in a sufficiently shielded room, and materials used with this equipment are securely stored. Another participant mentioned: "The hospital has no written standardized procedures for controlling such important sites."

Table 11: Radiological equipment (focus group data)

#	Items	FG1	FG2	FG3
48	Radiological equipment is located in a sufficiently shielded room	√	√	√
49	The hospital appropriately stores hazardous materials	√	√	√
50	The radiation clinics located in a sufficiently shielded room	√	√	√

The major safety themes related to laboratory departments are presented in Table 12. Workers share the view that laboratories are supplied with good water supplies, plumbing and drainage systems, ventilation systems, and well-secured electrical wirings and outlets. The majority also reported that there is no station for the treatment of liquids emerging from laboratory departments, and the storage requirements and handling procedures are not in conformity with the specifications that were mentioned. One participant stated: "In Jordanian hospitals, one of the main problems is the proper disposal of hazardous waste."

Table 12: Laboratory department (focus group data)

#	Items	FG1	FG2	FG3
51	Lab has a good water supply, plumbing, and drainage	√	√	√
52	Lab has safe and well-secured electrical wirings and outlets	√	√	√
53	Lab materials are safely stored on secure shelves	×	×	×
54	Lab has a good ventilation system	√	√	√
55	Waste water is sent to the sewage treatment plant	×	×	×

Table 13 presents the results of the groups' discussions related to emergency rooms. Participants' discussions focused predominantly around the fact that these sites contain a secure electrical system. Persons reported that there were no secured cabinets for medical tools near the operating table; they use unsecure mobile carts in practice. One worker said: "Emergency departments need to secure mobile cabinets to store medical equipment and medicine."

Table 13: Emergency rooms (focus group data)

#	Items	FG1	FG2	FG3
56	Equipment and supplies needed for treatment are placed near the operating table and are securely set	×	×	×
57	Bolts are provided in the right place on walls so that devices can be removed and fixed in secure location when not in use	√	√	√
58	Emergency rooms contain safe and secure electrical wirings and outlets	√	√	√
59	Supplies and materials are secured in cabinets or shelves	×	×	×

Table 14 presents issues reported by focus group participants in relation to the radiation therapy department, which is available in one public hospital in Jordan. It is effectively shielded from radiation hazards and has good ventilation. However, these units lack a monitoring unit with an alarm system and waste treatment plant. One worker said: "This public hospital needs radiation safety program in place that is followed and documented, and professional staff that receive training according to this safety radiation plan."

Table 14: Radiation therapy department (focus group data)

#	Items	FG1	FG2	FG3
60	Effective shielding from radiation hazards	√	NA	NA
61	Units have good ventilation	√	NA	NA
62	Monitoring unit with alarm and radiation survey meters with alarms	×	NA	NA
63	Any wastewaters sent to a water treatment plant	×	NA	NA
64	Isolation storage and proper handling of radioactive or harmful materials	√	NA	NA

*N/A: not applicable

5. Conclusions

Managing safety in hospitals is a challenge. An assessment of the preparedness of Jordanian hospitals in the case of emergencies and disasters was conducted in this study using the Hospital Safety Index for structural and non-structural safety. The current study held discussions with three focus groups on 64 items considered as essential issues for the safety of hospitals. One of the most important findings of the current study was that hospital sites, their shape, and structures are not an obstacle to the ability to continue to provide healthcare services during disasters. Roofs and ceilings were created in a manner resistant to abnormal events to some extent. Hospitals can continue to work for several days in the case of water or electric outages, although parallel results show that backup electricity generators face the risk of not working in floods. It seems that hospitals are aware of laws and regulations and have plans related to the management of safety, but there is not full, continuous commitment to implement these laws or monitor these plans. The results also show a lack of modern treatment plants for treating waste from hospitals, especially those issued from dangerous sites; this means that newly built or renovated Jordanian hospitals are largely committed to the application of international safety standards, but they still do not rank as ready to work in during and after disasters. The main limitation of the current study is its focus on newly built public hospitals; thus, the findings of this study cannot be generalized to other public and private hospitals in Jordan. Another limitation is that the study only considered the structural and non-structural standards of the Hospital Safety Index, although consideration of the functional standards will help in better assessing the readiness of hospitals during emergencies.

5.1 Recommendations

To improve the safety conditions in Jordanian public hospitals, this study recommends implementing the following:

- Hospitals need an effective plan to manage the safety of the physical environment and training of relevant staff, and need to ensure that this plan is fully implemented.
- Hospitals need to use modern equipment to monitor dangerous sites in order to have high-level emergency responses.
- Hospital departments need secure cabinets and vehicle trolleys to save important materials and medical equipment.
- Hospitals need a plan for correction of identified deficiencies in safety and security issues.
- Backup electrical generators need to be kept at sites not prone to the effects of flooding.
- Hospitals need to create waste and hazardous materials treatment plants.
- Hospitals need to expand the distribution of portable fire extinguishers in addition to fire resistant materials and facilities.
- The Jordanian Ministry of Health needs to set safety standards to ensure hospitals' safety in normal and abnormal conditions.
- Further studies need to be conducted dealing with all hospitals in Jordan.

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