

Improving Local Hospitals Response Against Crises Events and Terror Incidents

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Abstract

The research discusses and studies crises or disaster phenomenon which includes terror incidents that face communities including our country. One of the most important effects of these events is the resulted medical injuries cases. Studying and analyzing these cases characteristics and volume is being done first, and it proofing certain differ of crises medical injuries characteristics from routine cases, depending upon this result, the research goes toward searching and reviewing planning and design requirements needed to be adopted in hospitals buildings design to make them respond efficiently to this demand (care and treatment of medical injuries caused by crises events including terror incidents). Finally evaluation questionnaire is done for a sample of selected medical and nursing staff to conclude and identify the most important and appropriate ingredients suitable to be adopted in local hospitals.

Key words: Crises, terror attack, medical injuries

خلاصة

تضمن البحث استعراض ودراسة ظاهرة الازمة او الكارثة ومن بينها حوادث الارهاب التي تتعرض لها المجتمعات وكما هو حاصل في بلدنا وما تسببه من اصابات للشخص. احدى اهم الآثار التي تتركها تلك الحوادث والازمات هو ماتخلفه من اصابات بشرية طبية حرجة وخطيرة . تمت دراسة وتحليل حجم وخصائص تلك الحالات، والتوصل الى ان تلك الاصابات الطبية تختلف في حجمها ونوعها عن حالات الاصابات الطبية الاعتيادية، وبناء على هذه النتيجة فان البحث توجه نحو استقصاء ومراجعة المتطلبات الاساسية اللازم اعتمادها في تخطيط وتصميم المستشفيات لجعلها تستجيب وبشكل كفوء لهذا النوع من الطلب (رعاية وعلاج الاصابات الطبية جراء حالات الازمات وحوادث الارهاب) واخيرا فقد تم اجراء استبيان لمجموعة منتخبة من الكوادر الطبية والتمريضية وذلك لغرض تقييم مجموعة المتطلبات التخطيطية والتصميمية والوصول الى ما هو مهم ومناسب منها ليكون ملائم للتطبيق في مستشفياتنا المحلية.

الكلمات المفتاحية: الازمة، هجوم ارهابي والإصابات الطبية

Research Hypothesis :

The research assumes the necessitate of special planning and architectural design requirements to be adopted in hospitals buildings design that enhance their response to care for and treat injuries cases due to crises and terror accidents, as those injuries cases differ quantitatively and qualitatively from those in normal conditions.

Research Problem and Goal

Research problem concerns with the lack of perception of planning and architectural design ingredients, to be adopted in local hospitals buildings design , for the purpose of making (hospitals) response efficiently to medical injuries cases that resulting from crises events in general and terror attacks especially , as these cases differ from normal condition injuries cases .The **goal** of this research lies on finding out and evaluating the required planning and architectural design requirements leading towards improve hospitals buildings to response efficiently to this kind of demand.

For the purpose of accessing the aim of the research, it adopt the following approaches as **research methodology**:

- Studying and analyzing the characteristics of medical injuries caused by crises events and incidents of terror attacks.
- Identifying and recommending planning and architectural design requirements universally adopted for hospitals buildings to improve hospitals response to crises events.

- Getting real evaluation of the mentioned requirements from selected sample of medical and nursing staff in some local hospitals.

Introduction

Terror attacks as crises events have become a phenomenon and a global threat, so strategies for emergency response to deal with terrorism is one of the utmost important tasks because of its direct impact on the national security of each country. Terrorism has become difficult to prevent or control, so fighting it first and medical relief for injured victims secondly become an important topic.

It is the duty of the responsible parties to address such phenomenon a lot of available means and resources to prevent and reduce it, then minimize its effects on other hand. Certainly mass medical injuries cases are in the foreground and required willingness to be absorbed through the provision of appropriate response by the medical establishment to deal with this large and sudden amount of injuries. It is obvious that hospitals and their treatment functional units are the most important means that can care and treat medical casualties'cases resulting from these attacks through adopting many planning and architectural design requirements as will be detailed later.

Disasters and Crises Events

Disaster or crises is a major accident because of it there will be large losses of life and property, it can be divided into disaster act of nature such as floods, earthquakes, volcanoes and other man-made which occurs either because of an error in the manufacturing of (airplanes, buses, ships, trains, factories, reactors) or terror attacks.(Btiha,2011)

Terror attacks are expected to be the first threat of the most prominent among the ten expected threats to humanity in the next seventy years. (De-wen,2014)

Often the available resources are not cope with disasters and crises events volume, may be the reason for that is first the location of the incident and the difficulty to reach it , second is the large amount of wounded and injured peoples ,third is the severity of many injuries. Simple injuries do not constitute a problem for rescue and treatment team on site, but with the presence of much severe injuries, hospitals need to have many preparations in advance and provide additional resources like additional beds, more doctors, nurses, technicians, and equipments, in addition to activate special arrangements, which is known as (Hospital plan to meet disaster and crises) (New Zealand government,2011)

Crises and Terror Attacks Injuries volume

For the purpose of planning and designing required and appropriate hospital facilities which have the enough capacity to absorb real amount of crises injuries, it ought to rely on accurate statistics of crises accidents , type of crises, number of casualties (dead and injured) for each incident. Generally and to make a good assessing for that it is estimated that available hospitals in certain city must adopt a response (accommodation and treatment) of disasters and crises events injuries at a rate of 500 cases injury per one million population.(Hanfling,2004).In normal conditions,the volume of casualties'treatment facilities to be allocated in the hospitals (in a specific area or particular city) must depend on injures amount, type of injuries, allowed waiting time prior treatment. (Australasian college, 2007).

But regarding to terror attacks issue as a main and important crises events we face and struggle every day. The below statistics show up the real volume and characteristics of resulting casualties which will guide toward deducting essential hospitals planning and design requirements.

Terror attacks as a crises occur in (85) different countries all over the world, but these attacks are concentrated in three specific countries, Pakistan, Iraq, and Afghanistan, and this what constitutes proportion of (55%) of the number of all attacks, and the proportion of (62%) of deaths and the proportion of (65%) of wounded and injured people. (the Lancet, 2011) There have been at least (1003) terror bombing incidents in Iraq between 2003 and 2010, which caused injury to at least (30644) and the killing of at least (12000) (the Lancet, 2011)

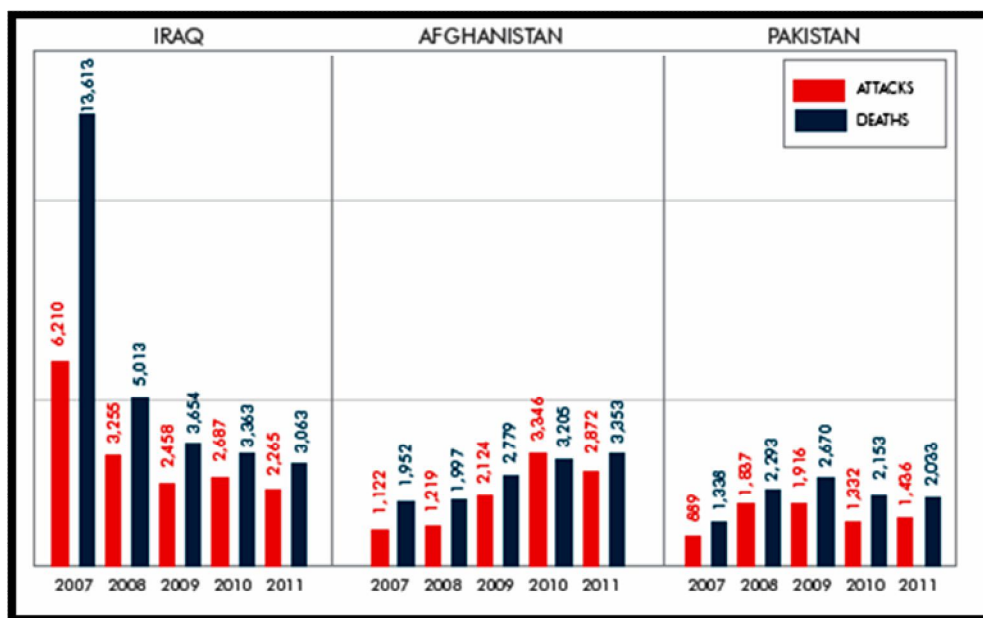


Fig (1) Total number of terror attacks and death in Iraq, Afghanistan, Pakistan 2007-2011 Source : Office of the Coordinator, 2013

Iraqi Government reported that 239,133 Iraqi injuries were recorded between 2004 and 2011. (Casualties of the Iraq War / Wikipedia), while office of coordinator for counterterrorism reported that 1271 total attacks occurred in Iraq during the year 2012, table (1) (Office of the Coordinator, 2013)

Table (1) number of terror attacks and the casualties resulting in Iraq, year 2012 source: Office of the Coordinator for Counterterrorism, 2013

Total Attacks	Total Killed people	Total Wounded people	Average Number Killed per Attack	Average Number Wounded per Attack
1271	2436	6641	1.92	5.23

Total ratio of injuries to the dead people in the bombing attacks in Iraq was **(2.5) injured to (1) dead**, Where **men injuries ratio was 75%, while women injuries ratio was 11%, while children represented 14 %**, (The Lancet, 2011) fig (4).

Injuries cases amount resulting from the incident has a major impact in assessing required medical efforts to be provided, and that represented by the number of rescue teams and necessary transport means and finally the number of hospitals and capacity of each hospital to rescue and treat those cases.

Statistical data in above show the total cases of medical injuries as a result of terror attacks took place in Iraq in one year (2012), can be taken as an indicator

which enable planner to calculate the size of the medical services(exam, treat, care) required to be provided in local hospitals, noting the differences in casualties total numbers among regions and provinces.

Medical System Levels and Responsibilities During Crises Events

The successful response by medical system to rescue, care and treat injured peoples depends dramatically on the coordination between three levels of care: fig(2) (Isaac Ashkenazi ,2010)

- **Pre hospital:** urgent and fast steps and stages taken by rescue crews at incident scene to confirm rapid rescue for injured peoples.
- **Distribution of injured peoples:** make appropriate and effective distribution for injured peoples to available hospitals nearby the event site.
- **Hospital:** complete rescue and other medical services through a proper management of treatment resources for injured peoples arriving hospital .

The problem facing hospital in case of crises are: 1- insufficient patient beds, 2-seriousness and complexity of injuries cases,3- lack of care and treatment resources comparing with large volume of arriving injuries cases .

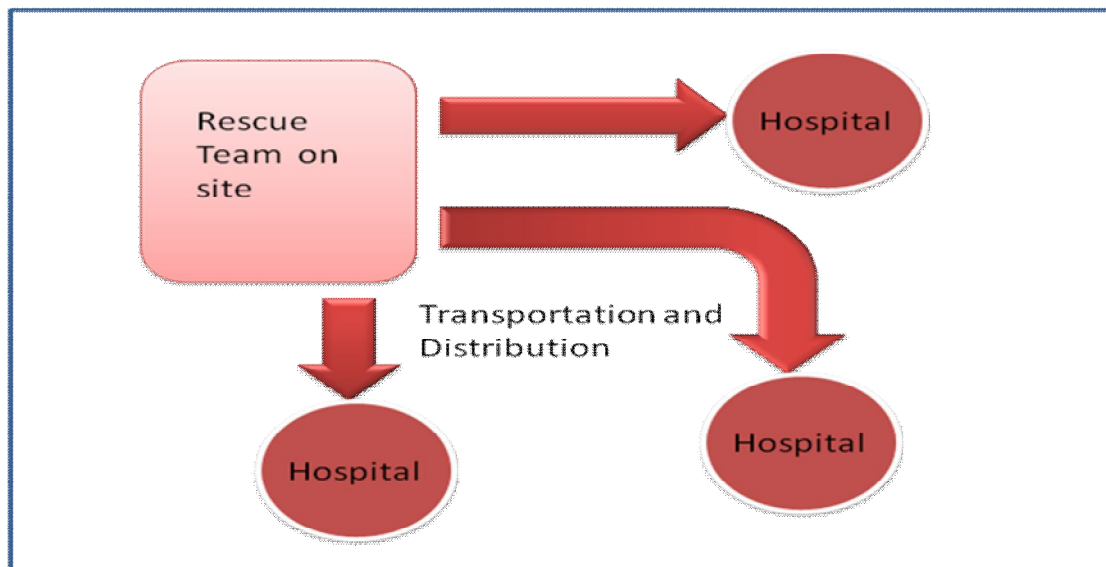


Fig (2) medical care levels for injured patients during crises time

Source: researcher

Triage Levels for Casualties' Cases Resulting From Crises Incidents

Crises produce a large number of serious injuries that need to have serious, immediate and ongoing implications for local, regional and national health services including the following steps: (U.S. Department of health human services,2007).

- **Primary triage** involving emergency services : medical teams on site event are the one who start treat the injured peoples,their work boils down in sorting and classification process of the injured peoples, providing advanced first aid to some of the injured people,performing some urgent simple surgery to rescue some of the injured, taking care of the injured in the area who will not relocate from the site immediately.

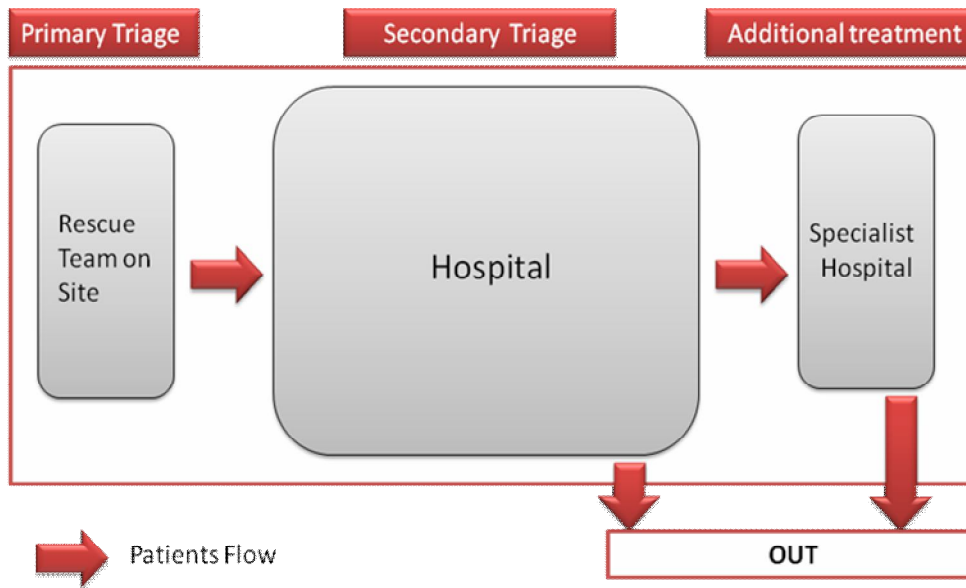


Fig (3) Triage levels for casualties' cases / Source: researcher

• **Secondary triage**, stabilization and treatment, involving accident and emergency resources in hospitals, one hospital or many adjacent hospitals have to work in cooperation and coordination with other health institutions under a plan prepared in advance for the purpose of achieving an adequate response to care for and treat accident injuries. Upon confirmation of an accident occurring, the daily work system at the hospital will be changed so hospital can deal with the large numbers of injuries that will reach, hospital preparedness do not include injuries emergency treatment only, but also the rest of the services like other medical, paramedical, administrative, logistics, and security. Hospital represents the end destination receiving victims, as it has its own therapeutic, diagnostic units, medical and administrative staff who are trained prior to rescue and treat injuries.

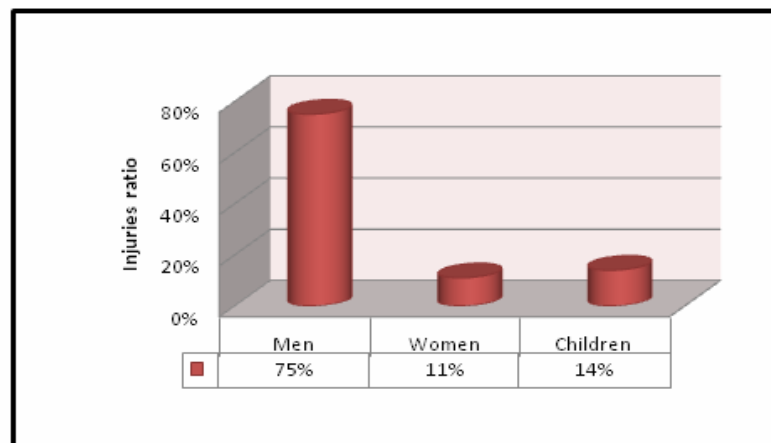


Fig (4) Medical injuries ratios caused by terror incidents
Source: Lancet medical journal British /2011

- **Other specialist resources** (e.g., burn services, mental health): other specialist medical centers will care and treat injured if they have more complicated injuries like burn, fracture, plastic surgery, mental illness.

Characteristics of Crises (terror incidents) Injuries in Iraq

Statistics and data shown in above noted the existence of qualitative and quantitative differences for medical injuries cases that resulting from crises and terror attacks from usual injuries cases, and as the following: (Lancet medical journal British, 2011)

- 1 - Crises resulting large amount of injuries cases which needed to be received and treated in the hospital at one time.
- 2- Majority of medical injuries cases resulting from terror attacks (bombing) are wounds, fracture, burn, poisoning by explosive materials.
- 3- The use of explosives in terror incidents often cause large numbers of injured patients with complex and serious wounds.
- 4- As many injured patients are able to evacuate themselves after the incident, guess presented that **for each severe injury case which require urgent and complete care and treatment, there will be five cases not need such care and treatment**.
- 5- Statistics show that **men's** injuries cases proportion was **75%**, **women** was **11%**, while **children** represent **14%**.

Treating Approaches of Injured Patients

There are two approaches to care and treat arriving crises events injuries in hospital, the first shows the full separation of severe cases route from simple cases, starting from entering until the end of the treatment, Fig(5), while the second approach is to mix these two types of cases, partially or completely, and make treatment and care within the same therapy spaces. (Department of health and social security, 1969). The both approaches are concerned with hospital work policy.



Fig (5) The various routes of injured patients in hospital

Source: researcher

Requirements Support Hospital Responding Efficiently to Crises and Incidents of Terrorism:

To ensure the success of hospital's response to care for and treat medical injuries caused by terror attacks there are two important supporting factors, the first is administrative procedures while the second is the adoption of planning and architectural design decisions for hospital buildings.

1-Administrative procedures and arrangements as follow :(U.S. Dept. of health and human services , 2007)

1-1 Relieving injured patients pressure on hospital resulting from the incident by redirect additional patients to other adjacent hospitals, hospital must send maximum absorption capacity signal to the concerned authorities before reaching it, in that case this hospital is appointed as only rescue hospital (save lives) before being transferred to another hospital.

1-2 Adopting early warning systems to make direct and immediate identifying the absorptive capacity of hospital departments involved in provision of emergency medical service in time of crisis.

1-3 Putting strategic planning to solve congestion dilemma on hospital at incident time through the activation of sum procedures to increase the number and size of diagnostic and treatment spaces, depending upon exclusion ordinary and simple cases from medical treatment, diagnostic services and accommodation .

1-4 Full coordination between hospital units and clinics including laboratory, x ray, blood banks for the purpose of providing all available resources .

1-5 Retention and prepare part of hospital resources care and treat for later access waves of injured patients who are mostly patients with severe injuries.

2-Planning requirements: <mailto:sarita.chungchildrens.harvard.edu>

2-1 Assigning areas or spaces to be turned into examination and evaluation facilities (e.g. outdoor yards) and to be the alternative care sites to take care of simple injuries, severe injuries allocated in closed places such as halls, meeting rooms.Fig(6)

2-2 Assigning monitoring units as alternative place for patients to go, they are one of the means to reduce the waiting and admission time and to overcome congestion. Fig (6)

2-3 Assigning areas within the hospital as isolation places, and assign others to work as Intensive care units. (S Chung ,M Shannon)

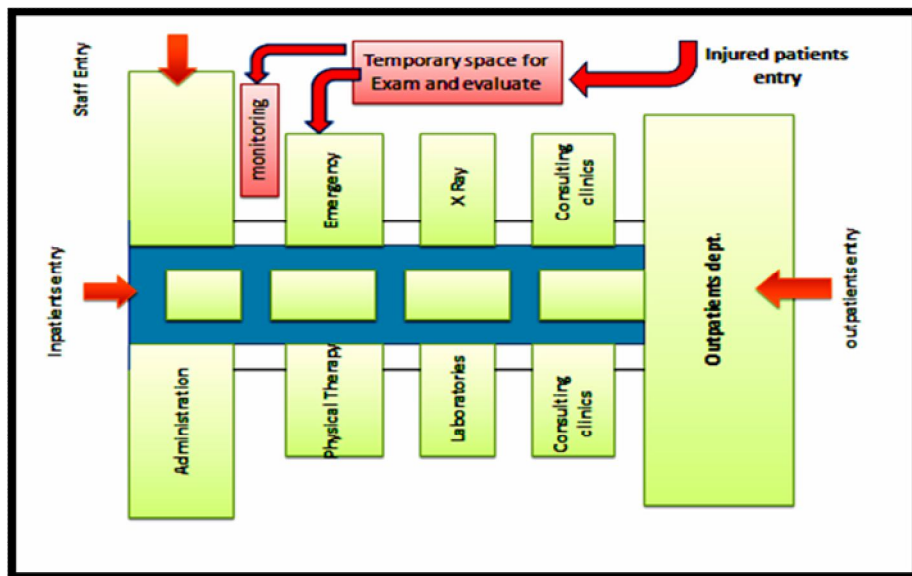


Fig (6) Assigning areas as second alternative rescue and monitoring units
source : researcher

2-4 providing more additional men wards (three time more than women and children wards) to accommodate large ratio of injured men.

3-Architectural design requirements:

3-1 Hospital is exposed to a wide amount of injured patients entry and heavy movement for individuals within a short period, that require to design entrances and hallways in front of the reception department as wide and efficient to absorb the momentum of the congestion and heavy traffic. (Australasian college, 2007)



Fig (7) Design entrances and hallways to absorb the momentum of the congestion and heavy traffic Source: Australasian college

3-2 Medical functional units' spaces must be designed with enough number, size and flexibility to realize the large number of injured patients (Australasian college,2007)

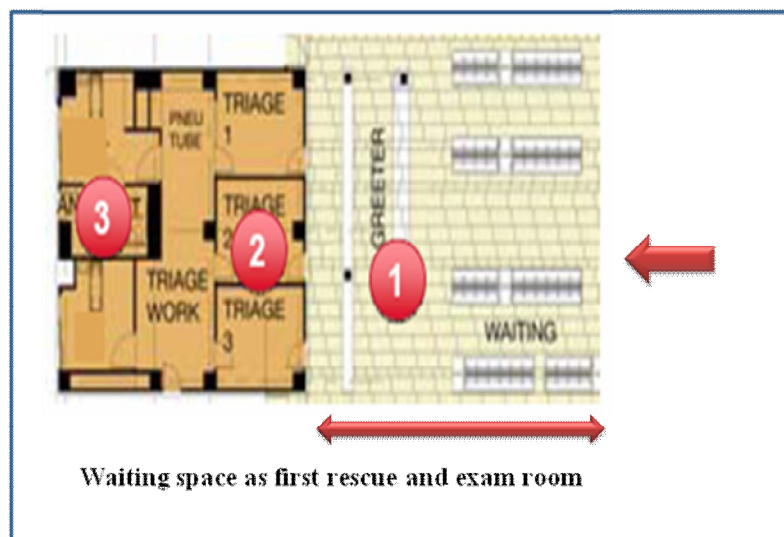


Fig (8) Provide early rescue starting from the entrance of treatment unit
source: Hernandez, 2012

3-3 Providing early rescue and immediate care, starting from the entrance area by preparing entrance and reception area for these activities Fig (8), where medical staff instructed directly to make classification process and evaluate the cases of injuries in this area .(Hernandez, 2012)

3-4 separating the minor injuries cases from severe cases , Fig (9), by separating the minor injuries routes and facilities from those with severe injuries, that will avoid patients momentum on rescue and treatment units. (Hernandez , 2012)

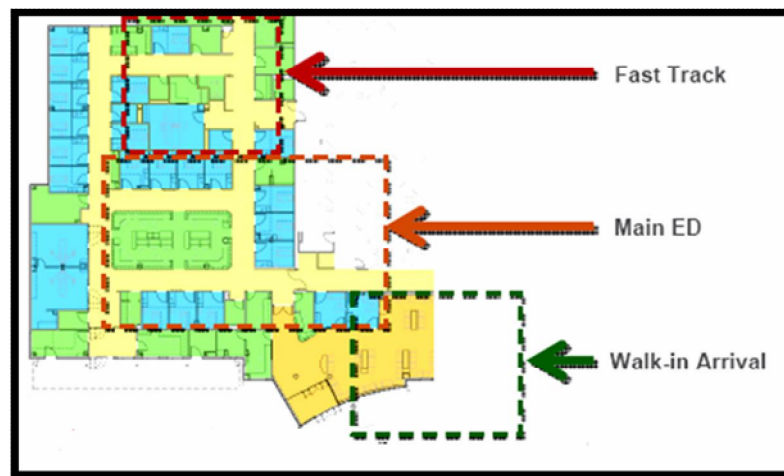


Fig (9) Full separation of minor injuries cases from severe cases

Source : Hernandez , 2012

- 3-5 Treatment rooms must be designed in away to accommodate different types of serious injuries cases, and make the possibility to make injured patients enter from the two room sides. (Hernandez,2012)
- 3-6 Adopting standard type of treatment rooms (shape and size),to make easy treatment of all kinds of injuries, increase injured patient's absorption and enhance function of treatment suite.(Hernandez,2012)
- 3-7 Allocating service station on the center of treating area, Fig (10), which enable staff to make direct monitoring on injured patients and provide required services and stuff. (Hernandez, 2012)

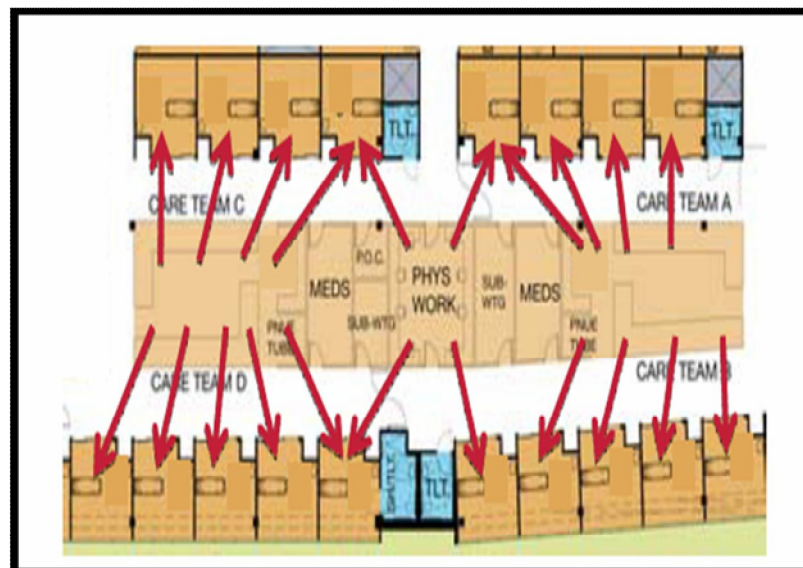


Fig (10) Allocating service station on the center of treating area

Source : Hernandez, 2012)

3-8 Depending on using exam and treatment rooms which contain chairs only instead of beds, because most injuries are light and simple, this will increase the number of treatment rooms and provide more flexibility (Hernandez, 2012)

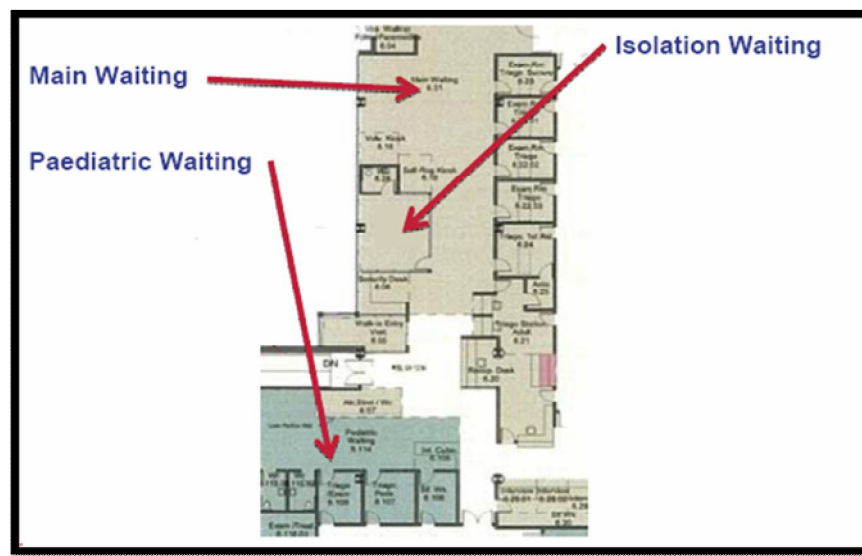


Fig (11) Dividing waiting area into many waiting areas
source: Hernandez, 2012)

3-9 Isolating part or all treatment area to prevent infection, inflammation in case of injuries contamination . (Hernandez, 2012)

3-10 Dividing waiting area in medical unit into many sub waiting areas (main waiting - waiting for isolated patients- relatives waiting), Fig (11), this will increase efficiency of treatment area. (Hernandez, 2012)

3-11 Allocating fixed (x ray) unit near the treatment suites.(Hernandez, 2012)

Evaluation Questionnaire:

For the purpose of evaluating the convenience and necessity of previous recommended planning and design requirements (identified in theoretical part of this research) by local hospitals medical and nursing staff, and if these requirements are applicable to be adopted in local hospital buildings and designs, a list of modified recommended requirements (planning and design requirements required to improve hospital response to crises events including terror attacks), as shown in evaluation form below was prepared and explained carefully to a selected medical and nursing staff (including 10 samples in many local hospitals to get their evaluation value and idea for each item .

The evaluation value point range was in the limits of (0 - 10 point) as (0 point) result will indicate the useless of the item,(5 points)result will indicate the acceptance threshold level while (10 point) will indicate the serious necessity and importance of this item .

Evaluation Questionnaire Form

Name :

Job:

Position:

		Planning and Design Requirement	Value 0-10
Planning Items	1	Assigning areas or spaces to be turned into examination and evaluation facilities (e.g. outdoor yards) and to be the alternative care sites to treat simple injuries, severe injuries allocated in closed places such as meeting halls.	
	2	Assigning temporary monitoring units as alternative place for patients, to reduce the waiting and admission time and to overcome congestion	
	3	Assigning areas within the hospital as isolation places, and assigning others to work as intensive care units.	
	4	Providing additional men wards (three times more than women and children wards) to accommodate large ratio of injured men patients.	
Design Items	5	Designing efficient and wide entrances and hallways in front of treatment departments to absorb the large number of injured patients entry and heavy movement of individuals	
	6	Medical functional units' spaces such as (emergency dept, operating theater, intensive care unit, surgical wards) must be designed with enough number, size and flexibility to realize the large volume of injured patients .	
	7	Providing early rescue and immediate care, starting from the entrance area by preparing entrance and reception area for these activities	
	8	A complete separation between minor injuries cases and severe injuries cases, by separating the minor injuries routes and spaces from those related with severe injuries .	
	9	Treatment rooms must be designed to meet different types of serious injuries cases	
	10	Adopting standard type of treatment rooms (shape and size) , to make easy treating all kinds of injuries	
	11	Allocating service station in the center of treatment area, which improve staff direct monitoring on injured patients and provide required services and stuff	
	12	Depending on using exam and treatment rooms which contain chairs only , because most injures are light and simple, this will increase the number of treatment rooms and provide more flexibility .	
	13	Making isolation for a part or all of treatment area to prevent infection, inflammation in case of injuries contamination	
	14	Dividing waiting area in medical units into many sub waiting areas (main waiting - waiting for isolated patients - relatives waiting, this will increase efficiency of medical unit .	
	15	Allocating fixed (x ray) unit near the treatment suites.	

Evaluation Questionnaire result values

The table below include the evaluations values (9 0-10 points) submitted by medical and nursing staff (10 person) for all planning and design requirement:

Planning and design requirement	Medical and nursing Staff										Total
	1	2	3	4	5	6	7	8	9	10	
Assigning areas or spaces to be turned into examination and evaluation facilities (e.g. outdoor yards) and to be the alternative care sites to treat simple injuries, severe injuries allocated in closed places such as halls, meeting rooms.	8	9	8	8	9	9	8	9	9	8	85
Assigning temporary monitoring units as alternative place for patients to reduce waiting and admission time and to overcome congestion	8	9	8	9	8	7	9	8	9	8	83
Assigning areas within the hospital as isolation places, and assigning others to work as Intensive care units.	7	8	8	9	9	8	8	9	8	9	81
Providing additional men wards (three times more than women and children wards) to accommodate large ratio of injured men patients	8	9	8	9	7	8	9	8	9	8	83
Designing efficient and wide entrances and hallways in front of treatment departments to absorb the large number of injured patients entry and heavy movement of individuals	8	9	9	9	8	10	9	9	8	8	87
Medical functional units' spaces such as (emergency dept, operating theater, intensive care unit, surgical wards) must be designed with enough number, size and flexibility to realize the large volume of injured patients	10	9	9	9	10	9	9	8	9	10	92
Providing early rescue and immediate care, starting from the entrance area by preparing entrance and reception area for these activities	9	10	9	9	8	10	8	9	10	9	91
Planning and design requirement	Medical and nursing Staff										Total
	1	2	3	4	5	6	7	8	9	10	
A complete separation between minor injuries cases and severe injuries cases, by separating the minor injuries routes and spaces from those related with severe injuries	6	6	8	6	7	6	7	6	7	6	65
Treatment rooms must be designed to meet different types of serious injuries cases	6	7	7	6	5	7	6	6	6	7	63

Adopting standard type of treatment rooms (shape and size) , to make easy treating all kinds of injuries	7	6	6	7	6	5	6	5	6	6	60
Allocating service station in the center of treatment area, which improve staff direct monitoring on injured patients and provide required services and stuffs	8	10	9	8	9	9	10	8	9	8	88
Depending on using exam and treatment rooms, which contain chairs only , because most injures are light and simple, this will increase the number of treatment rooms	7	6	7	6	7	6	6	7	6	7	65
Making isolation for a part or all of treatment area to prevent infection, inflammation in case of injuries contamination	6	6	6	7	6	6	5	7	5	6	60
Dividing waiting area into many sub waiting areas (main waiting - isolated patients - relatives waiting)	7	6	7	7	8	8	7	6	6	8	70
Allocating fixed (x ray) unit near the treatment suites	8	9	8	10	8	9	9	8	10	9	88

Analysis and Evaluation of Questionnaire Results:

- All evaluation values for each requirement item by each member of staff were not less than (5 points, threshold level of acceptance). It referred that each item (as identified in theoretical part of this research) was accepted and recommended by all staff members.
- Planning requirements items evaluation result values (for 10 members) were in the range of (81 point 85 point).It indicated the full and high acceptance by all medical staff members for all these requirements items .
- Architectural design requirements items evaluation result values (for 10 members) were in the range of (60 point 92 point). It indicated the full acceptance by all medical staff members for all these requirements
- There were differences in design requirements items evaluation result values as shown in result form, this was accepted due to the difference of necessity of each item comparing with the other .
- Most requirements items evaluation values points were in the range (70- 85 point).It indicated the high convenience and necessity of these requirements to be adopted in local hospital building to improve their response to crises events and terror attacks .

Conclusions and Recommendations

- Terror attacks are one of critic crises events which face the communities, this threat event impose the need for special preparedness by community authorities including health system associations.
- Crises events leads to large number of casualties which require efficient response (quantitatively and qualitatively) from health system including hospitals as they are the essential part in health system which responsible for rescue, care and treating crises injuries.

- Medical injuries caused by terror attacks (as crises event) have many characteristics which make them differ from ordinary injuries, as they are (large in number of injuries which need a large medical services capacity, some of them are urgent and dangerous which need urgent rescue efforts , many of them are complicated injuries which need more additional specialized medical centers or hospitals .
- Depending upon mentioned (crises and terror incidents medical injuries) characteristics , many preparedness and procedures must be activated and done to improve hospitals responding to absorb these crises injuries, some of them are related with adopting specific planning and architectural design requirements, the other concern with changing hospital daily work policy .
- The recommended planning and design requirements include assigning and creating temporary areas (tents, shades, halls) outside and inside hospital building to absorb overload injured patients and prevent overcrowded expected , it also include designing requirements such as adopting specific architectural design solutions, proposals, certain spaces configuration in medical units plans and layout to improve their react (rescue and treat) towards expected injured patients and increase their capacity to absorb and treat the large number and complicated injuries cases .
- Evaluation questionnaire results got from selected sample of medical and nursing staff (10 persons) in local hospitals, showed their acceptance and recommendation for all 15 proposed (hospitals planning and design requirements) as included in theoretical part of this research.
- Medical and nursing staff put high values points for some (planning and design requirements) items , while they put mid values points for the other remain items, this result reflected the high importance and the necessity of all items to be adopted in local hospital buildings design .

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