

A Study on the Safety and Security Issues of Hospital Buildings in Bangladesh

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Abstract

During times of disaster, hospitals play an integral role within the health-care system by providing essential medical care to their communities. Any incident that causes loss of infrastructure or patient surge, such as a natural disaster, terrorist act, or chemical, biological, radiological, nuclear, or explosive hazard, often requires a multijurisdictional and Multifunctional response and recovery effort, which must include the provision of health care. Without appropriate emergency planning, local health systems can easily become overwhelmed in attempting to provide care during a critical event. The main focus of the paper is to study on the existing safety and security standards of local hospital and compare them with the recommended and standards in terms of safety and security issues. A comprehensive study on the local hospitals requires huge time and efforts. It is almost impossible within the time schedule and accessibility for surveying and observation is also limited to a large extent. So the study focused on the local situations, comparison with standards and users reaction.

INTRODUCTION

The price we pay for the failure of hospitals or health facilities due to disasters is too high. In comparison, the cost of making hospitals safe from disasters is tiny. Disaster damage to health systems is a human tragedy, results in huge economic losses, deals devastating blows to development goals, and shakes social confidence. Making hospitals and health facilities safe from disasters is an economic requirement, and also a social, moral and ethical necessity. Special attention must be given to

Ensuring the physical and functional integrity of health hospitals and facilities in emergency conditions. This is about more than just protecting buildings. Health facilities are only truly safe from disasters when they are accessible and functioning, at maximum capacity, immediately after a hazard strikes.

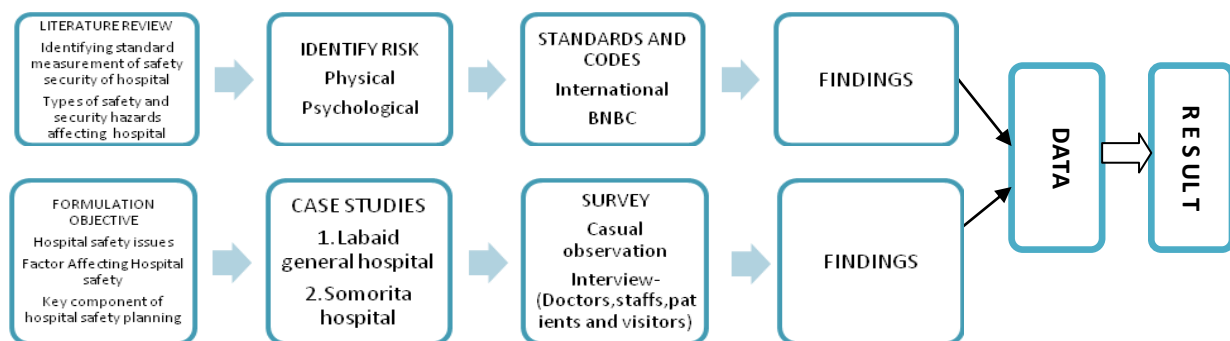
A hospital should adopt a safety and security plan to protect the patients, visitors and employees of the hospital from aggressive and violent behavior. The safety and security plan must include a process for hospitals to receive and record incidents and threats of violent behavior occurring at or arising out of employment at the hospital. The safety and security plan must prohibit a representative or employee of the hospital from interfering with a person making a report as provided in the plan. Whatever the case, hospital security is being assessed with greater concern and in more detail than ever before.

1.1 OBJECTIVE OF THE STUDY

The objectives of study are-

- To study the existing safety and security situations and evaluate them in terms of response from users
- Make recommendations to ensure how measures can be implemented to enhance the safety and security aspects of a hospital

1.3. METHODOLOGY



2. BACKGROUND

A few case outlined below would emphasize on the needs for safety and security issues

1. **“89 dead in Kolkata hospital fire”** A fire at the hospital occurred at Dhakuria in South Kolkata in the early morning of the 9th of December, 2011.([HT Correspondent](#), Hindustan Times Kolkata, December 09, 2011)
2. **“Female doctor killed in city”**.(NEW AGE, Staff Correspondent, Saturday December 1,2012)
3. **“Newborn stolen from DMCH”** Friday Dhaka, Feb 17 (BDNEWS) – An organized syndicate stole a newborn from the Dhaka Medical College Hospital (DMCH)
4. **Damage to health infrastructure in Gujarat, India** earthquake Health facilities destroyed: 1,813 (13 districts) .The cost of rehabilitation and reconstruction estimated at € 42 million.
5. **“Patients attack staff at secure mental health facility.”** Baillie Henderson Hospital on Saturday shortly after 11.45pm.(21 January, 2013)

2.2 COMPONENTS OF A HOSPITAL

- **Structural** : those essential elements that determine the overall safety of the system, such as beams, columns, slabs, load-bearing walls, braces or foundations.
- **Non-structural:** all other elements that enable the facility to operate. They include
- elements such as water heaters or storage tanks, mechanical equipment, shelving and cabinets and lifelines. In the case of hospitals, 80 per cent or more of the total cost of the facility can be the price of non-
- structural components. The basic form of a hospital is, ideally, based on its functions:
 - bed-related inpatient functions
 - outpatient-related functions
 - diagnostic and treatment functions
 - administrative functions
 - service functions (food, supply)
 - research and teaching functions

Physical relationships between these functions determine the configuration of the hospital.

2.3 POSSIBLE HAZARDS AFFECTING HOSPITAL

Safe hospitals have symbolic social value; losing a health facility leads to a sense of insecurity and

social/political instability. Disaster-resilient hospitals must be able to protect the lives of patients and staff and continue to function.

Natural Disasters

Tornados, Severe Thunderstorms ,Earthquakes ,Landslides, Tsunamis

Human Events

Internal Building Fire, Mass Casualty Incident, Internal /External HAZMAT Exposure, Biological or Chemical Terrorism, Hostage Situation, Bomb Threat, etc.

Technological Events

Communications Failure, Electrical Failure, Generator ,Water Failure, Fire Alarm, Med Gas Failure, etc.

3.1 INTERNATIONAL STANDARDS AND CODES FOR HOSPITAL

To ensure a safe, quality environment for both patients and employees, hospitals must follow certain facility safety regulations from the Joint Commission, OSHA, CDC, NFPA and other public health organizations.

To attain hospital accreditation hospitals need to meet Environment of Care standards for emergency management, worker safety, fire protection, environmental regulations, and more.

Facility and safety identification has a significant role in meeting these hospital accreditation standards, particularly:

- The Control of Hazardous Energy (Lockout/Tagout)
- Permit-Required Confined Spaces
- Walking-Working Surfaces
- Hazard Communication
- Emergency Action Plans

3.2 BANGLADESH NATIONAL BUILDING CODE FOR HOSPITAL BUILDINGS

D1- Normal medical facilities:

These shall include any building or portion thereof or group of buildings under single management in which general and specialized medical, surgical and other treatment is provided to persons suffering from physical limitations because of health, for example- Hospitals, nursing homes, clinics, dispensaries and sanatoria.

D2- Emergency medical facilities:

These shall include any building or portion thereof used for purposes of providing essential medical facilities having surgery, emergency and casualty

treatment areas which is equipped and designated to handle post disaster emergency, and is required to remain operational after disasters, for example-emergency and casualty units of designated hospitals, and clinics and dispensaries built as part of a disaster preparedness program.

Maximum permissible FAR for health care:

Occupancy		Type of construction		
		Type 1	Type 2	Type 3
D. Health care	D1	6.0	1.5	1.0
	D2	4.0	NP	NP

- Type 1: Highest degree of fire resistance
 - Type 2: Moderate degree of fire resistance
 - Type 3: lowest degree of fire resistance
- NP: not permitted

Minimum ceiling height:

D. Health care	<ul style="list-style-type: none"> • 3m for non air conditioned • 2.6m for air-conditioned building.
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Entrance to the building:

- All buildings shall have a covered entrance or other covered area for callers waiting at the door.
- The main Entrance door to the building shall not open into an uncovered exterior

Occupancy	Minimum width Of stair (m)
D. Health care	2.0

- Mezzanine floor should be calculated for far calculation.
- There must be a fire exit
- #there must be a fire exit control room of 10sqm.
- Parking -- chart of parking

Type of car	Parking width	Parking length	Inner radius	Outer radius
Normal car	2.4 m	4.6m
Bus/ truck	3.5m	10.0	8.7m	12.8

PARKING	SINGLE TRAFFIC ONE BAY	SINGLE TRAFFIC DOUBLE BAY	DOUBLE TRAFFIC
0	3.5m	4.0m	4.25m

45	4.5m	4.0m	4.25m
90	4.25m	4.25m	4.25m

Facilities for the differently able person

Entry and exit

- Entry clear opening >_1.2 M
- Push side clear area >_1.2X1.2 SQ. M.
- Pull side clear area >_1.5 X1.5 SQ. M.
- Revolving turn style entry way cannot be used
- Footpath ,corridor or any other walkway width >_ 1.2 M with proper space should be provided to turn a wheel chair

Wash room & toilet

- Toilet door width >_ 0.9 M and will open outside
- Internal area >_1.5 M X 1.5 M and western wc . must be used .
- Wash basin tap height =0.85 M and chair should reach piping
- Bathing space >_1.5M and without any enclosure on the floor.

Ramp

- Minimum width of ramp should be the same of corridor.
- Flight of exit ramp should not more than 1:12.
- If the ramp is more than 1:15 than a guard or hand rail must be occupied at the both side of the ramp.
- Minimum distance of two hand rail must be 1200mm.
- If the single flight of a ramp is more than 9m then there should be a landing in the ramp.

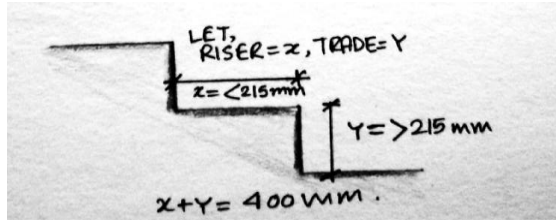
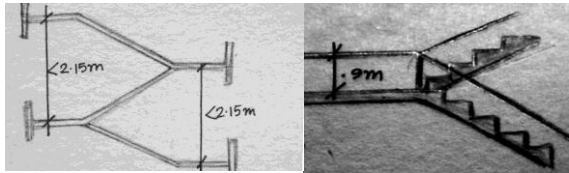
Building to building distance:

- Rajuk rule: to construct more than one building there must have an open space of 5m face to face and 2. m side by side.

Standard stair width

- 58(d) (1) for health facility building the minimum stair width must be 2.00m.
- #58(d) (2) riser and trade must be 400mm.
- #58(d) (4) maximum number of steps in one flight must be in 20.
- #58(d) (5) head room of the stair case must be 2.15m.
- #58(d) (7) railing must be .90m and it should be safe for children use.

- #58(d) (9) minimum height of roof top case must be 2.10m.



Width of the exit for each user

Sprinkler system	stair	Ramp & corridor	door
Without sprinkler system	25mm	18mm	10mm
Without sprinkler system	15mm	12mm	10mm

Doorway:

- For single door: highest user 12.
- Door to door highest distance: 23m

Standard of corridor & passage:

user	Width in meter (minimum)	Width in feet (minimum)
Under 50 person	0.9	2.95
Under 50 person	1.1	3.6
For bed moving condition	2.4	7.9

Minimum corridor width: 2.4 m (7'10")

Fire protection: fire resistance rating and classification of construction

Fire resistance topology

Type	Description
01	Highest degree of fire resistance
02	Moderate degree of fire resistance
03	Lowest degree of fire resistance

Occupancy load

Width(m)	Occupancy (person)
1.1	More than 50
0.9	Less than 50
1.8	Educational building
2.4	Healthcare building
	(>_150)

Wired glass fire rating

Fire rating	Max height(m)	Max width (m)	Max area(m2)
1.5 hours	0.85	0.25	0.065
0.75 hours	1.4	1.4	0.85
Fire windows	1.4	1.4	0.85

Position of exit

- Exit discharge should not be connected directly to the exit area
- Exit discharge should not be the part of the fired area or any danger area.
- Exit access should not be blocked at any time & lifted in dark spaces.
- Public building should have main exit discharge on that side the building which side is on the road side.

Character of exit

- For assembly or commercial purpose for one use exit maximum distance of exit from user = 75' (23 m)
- If level changes on exit access, ramp have to be provided where $D > 1'$ (300 mm) & steps can be provided where $< 1'$ (300mm) & riser for steps (for disabled) $< 8''$ (800 mm) here D = difference between level.
- Exit door cannot be sliding or hanging or revolving. Exit access should be side swing & have to swing towards outside from the direction of going
- Level cannot be changed
- Between interior and exterior adjacent side of the ext.
- Main exit of a public building have to serve 1/2 of the total users in multistoried public building every floor should have exit serving 2/3 of the users of that floor.

Source: Time savers standard

4. SURVEY OBSERVATIONS AND FINDINGS:

Hospitals are highly sensitive areas and casual observation at times requires a lot of efforts. Several hospitals were visited and observed, however it was difficult to document or record due to security

purposes .Following are the two case studies extensively done.

4.1 CASE STUDY-LABAID SPECIALIZED HOSPITAL

- Located at Dhanmondi house#06 road #04.
- Labaid specialized hospital is designed for 350 beds.



All Multidisciplinary medical professionals have assembled with their expertise and experience on the


- Common platform of Labaid Specialized Hospital.



Fire safety





- Fire and Safety Plan
- Building Design, Fire Protection Features and Furnishings
- Fire Drills and Fire Alarm Notifications
- Maintenance of Fire-Safety Equipment and Building Features




S L	FIRE SAFETY EQUIPMENTS	YES	NO	REMARKS	PHOTOGRAPHS
1.	Fire stair a. Width b.Location	√			
2.	Fire hydrant	√			
3.	fire extinguisher	√		Three types 1.ABC 2.CO2 3.Foam	

4.	Sprinkler system		√		
5.	Fire alarm	√			
6.	Smoke detector		√		
7.	Hose pipe	√			
8.	Stand pipe size	√		2" Dia	
9.	Fire resistance rating of corridor material				
10.	Heat detector		√		
11.	Restricting vertical spread of fire	√			
12.	Compartmentation		√		
13.	Signs and symbol of fire exit	√			
14.	Fire safety at Basement parking	√			
15.	Substation room	√			

Hospital Physical Security

- Know Who is in the Facility, including Patients, Staff and the Public
- Know What Materials Come In and Out of the Building
- Respond to Disruptive Behavior
- Respond to Weapons in the Building
- Secure Drugs, Toxic Material, and Hazardous Waste
- Have Sufficient Security Technology
- Know Your Security Personnel

SL	PHYSICAL SAFETY OF HOSPITAL	YES	NO	REMARKS	PHOTOGRAPHS
1.	Bomb detector at entry		√		
2.	Metal detector		√		
3.	Security camera	√			
4.	Secure Drugs	√			
5.	Safety for hazardous material	√			
6.	Protection of Equipment	√			
7.	Waste management plan	√			
8.	Radiation protected zone	√			
9.	Stair width	√			
10	Railing height	√			

SL	PHYSICAL SAFETY OF HOSPITAL	YES	NO	REMARKS	PHOTOGRAPHS
1.	security of patients belongings	√		Not adequate	
2.	Security at infant area	√			
3.	Safety in furniture & other equipments	√			
4.	Security at OT,CCU & ICU	√			



4.2 CASE STUDY -SAMORITA HOSPITAL

- **Samorita Hospital** was established in 1984.
- The Hospital is situated at the heart of capital Dhaka in Panthapath.
- Full range of inpatient and outpatient services
- Supported by comprehensive health care services

Fire safety





- Fire and Safety Plan
- Building Design, Fire Protection Features and Furnishings
- Fire Drills and Fire Alarm Notifications
- Maintenance of Fire-Safety Equipment and Building Features





SL	FIRE SAFETY EQUIPMENTS	YES	NO	REMARKS	PHOTOGRAPHS
1.	Fire stair a. Width b. Location	√		Not properly designed according to standard	
2.	Fire hydrant	√			
3.	Fire extinguisher	√			
4.	Sprinkler system		√		
5.	Fire alarm	√			
6.	Smoke detector		√		
7.	Hose pipe	√			
8.	Standard pipe size	√			
9.	Fire resistance rating of corridor material				
10.	Heat detector		√		
11.	Restricting vertical spread of fire		√		
12.	Compartmentation		√		
13.	Signs and symbol of fire exit		√		
14.	Fire safety at Basement parking				
15.	Substation room				

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3.	Security camera	√			
4.	Secure Drugs	√			
5.	Safety for hazardous material	√		Not adequate	
6.	Protection of Equipment	√			
7.	Waste management plan	√		Not well maintained	
8.	Radiation protected zone	√		Not well symbolized	
9.	Stair width	√			
10.	Railing height	√			

SL	PHYSICAL SAFETY OF HOSPITAL	YES	NO	REMARKS	PHOTOGRAPHS
1.	Security of patients belongings	√		Not adequate	
2.	Security at infant area	√			
3.	Safety in furniture & other equipments	√		Not adequate	
4.	Security at OT,CCU & ICU	√			

4.3 OBSERVATIONS

The ingredients for a functional hospital include ensuring that crucial medical equipment, utility services, and communications were functional, adequate medical supplies were ready, and that the hospital building and the staff were safe.

From several observations, interviews and surveys it can be said that LABAID closely complied with the standards and regulations meant for hospitals. However samorita being a hospital from the public sector did not have standardized systems and equipments. Only the basic functions, signage systems, security systems prevailed; no extra efforts were seen to be implemented in the hospital areas. Proper planning, location maps, inadequate fire protection systems were seen. However the labaid authority seemed much more advanced in seeking a standardized level, with regular fire drills, necessary equipments, planning of actions in times of disaster. It is extremely important that the disaster management plan is revised periodically, and the hospital staff put through regular drills to ensure that the plan could be executed well. In LABAID the hospital authority seemed very keen in keeping their safety and security system upgraded and advanced, which was definitely a positive factor. They ensured having a hospital safety committee, hazard analysis team, well-thought out disaster preparedness and management plan, protocols and regular training and mock drills for the staff.

A series of questions needs to be addressed to the hospital authorities – can the hospital handle a sudden surge of patients? Does the hospital have an alternative for continuous power and water supply?

What is the capacity of the water tank? Which are the critical areas in the hospital that can run on generator and for how long? Who is responsible for the building's structural safety? Did the hospital have a back-up of its medical records? How much medical supplies were in stock? Did the hospital have some communication back-up (radio) if land and mobile phone networks were affected? These questions leads to the need to identify hazards, prioritizing critical areas in a hospital, and the levels of preparedness that a hospital and its staff had to have to maintain functionality and perform their critical role during a disaster. Only a few comply with such criteria's. A large number of hospital facilities today need to strengthen its policy and risk assessment in order to save the lives of many in terms of any hazards or calamities

5. CONCLUSION

Safe hospitals are more than physical and functional integrity of the health facility. Safe hospitals means to be prepared for functioning in full capacity, appropriate for the needs of the affected people, immediately after a hazard strike. Major disasters have left thousands of persons without access to health as most health facilities could not function. People in unsafe hospitals and health facilities are at the greatest risk of losing their lives when a disaster strikes. Well-built or retrofitted hospitals have remained functioning following disasters. The health sector has excellent examples of and substantial accumulated experience contributing to safe health facilities.

6. REFERENCES

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- [5] Time saver standard
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