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**Original Article**


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## Adherence to Facility Management and Safety Standards in Shiraz Hospitals, Iran

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**Accepted for publication:** 10 August 2014

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### Abstract

**Background:** Evaluate the adherence to facility management and safety standards among governmental and non-governmental hospitals in Shiraz, Iran.

**Methods:** In this cross sectional study, 22 hospitals of the 33 hospitals in Shiraz, Iran including 13 governmental and 9 non-governmental facilities were surveyed. A 74-item self-administered questionnaire was used. Collected data were entered to SPSS Version 15.0 software. The level for statistical significance was set at 0.05.

**Results:** Adherence to facility management and safety standards was 65.17% in governmental and 72.79% in non-governmental hospitals. Compliance by governmental hospital in the areas of leadership and planning, safety and security, emergency management, medical equipment, utility system and staff education ranged from 60% to 86%. However, hazardous materials and fire safety adherence was below 50%. For non-governmental hospitals standard compliance for all areas ranged from 60% to 86%. Compliance rates between governmental and non-governmental hospitals in the areas of hazardous materials and staff education standards were statistically significantly different ( $p=0.02$  and  $p=0.05$  respectively).

**Conclusions:** To achieve more effective functional health care services, additional studies must be undertaken to assess the nature and extent of problem areas that exist in planning, implementing and monitoring of facility management and safety programs.

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**Keywords:** Facility management, Safety, Hospital, Standard

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**Cite this article as:** Hashemi A, Kouchak, Palenik Ch, Askarian M. Adherence to Facility Management and Safety Standards in Shiraz Hospitals, Iran. SDH. 2015;1(1):36-46.

### Introduction

Hospitals and other health care organizations should provide safe and properly functioning facilities for patients,

families, staff and visitors. To reduce and control hazards and to achieve to this aim, leaders must manage the physical facility, personnel, medical equipment and other resources according an effective plan

influenced by global standards and local authorities (1).

Several global and local guidelines in facility management and safety written in the following areas should be considered.

Safety is a state in which the organization's buildings, grounds and equipment do not pose a risk to patients, staff or visitors.

Security is protection from loss, destruction or unauthorized use (1). Hospitals should have effective plans for defining policies that better assure a safer and more accident-free environment (2).

Hazardous material control includes the handling, storage, use and proper disposal (1)

Biomedical waste includes any waste generated during diagnosis, treatment or immunization. According to the World Health Organization (WHO), 85% of hospital waste is non-hazardous, while 15% is infectious or harmful and if not properly disposed, it may seriously impact healthcare workers, patients, the environment and even the local population. Today, proper management of medical waste is a worldwide concern. In developing countries, awareness about segregation, storage, transportation and disposal is lacking (3- 5).

According to a study involving eight teaching hospitals in Karachi, only two hospitals had documented guidelines for waste management and a proper waste management team. Lack of awareness about such tenets and poor management of the waste process were the most important factors in waste management (6). Emergency management involves the proper and prompt response to epidemics and disasters (1). During times of disaster, hospitals play a key role by providing medical services to affected communities. If there is a lack of appropriate emergency planning coupled with limited recourses, any increase in community demand could disrupt of supply lines. The health system easily collapses while providing care during a critical event. Therefore, hospitals

should have a cost-effective plan for emergency management (7).

According to a US study of 395 hospitals, nearly all (99.0%) had emergency response plans for chemical attacks, while 97.8% had plans for natural disasters, 94.1% for epidemics and 93.2% for biological accidents. Crowding and lack of hospital capacity to handle emergency disasters, was a concern that led to the development of plans for establishing alternate care areas (8). Fire safety is the protection of property and people from fire, explosion and smoke (1).

Fires in hospitals are troubling because of flames, heat generation and smoke. Hospital failure in management of fire would increase the chances of the loss of lives and financial loss, particularly if damage required rebuilding. Long-term effects on the community would include the loss of a local "safe haven." Many of hospital patients are non-ambulatory and unfamiliar to hospital layouts. Therefore, employees must be aware of their hospital's fire plan and their responsibilities concerning fire prevention and control. The plan must include prevention, rapid detection, effective control, rapid extinguishment and damage control (9- 12). In 2008-2009, at least five disruptive fires occurred in London hospitals that resulted in evacuation of patients, staff and visitors in four of the hospitals and disruption of critical services in fifth. Study of these events indicated the need for better emergency plans and increased staff training (9). During the 20<sup>th</sup> Century, several serious fires occurred in New York City hospitals that caused substantial damage to facilities and killed a total of 266 people (11).

Medical equipment safety includes proper selection, maintenance and use of equipment (1).

Asset management is a critical part of hospital operations, including small inexpensive devices costing less than \$100 to complex machines costing millions of dollars. All are important assets because of

their effect on the quality of care and must be managed effectively.

To achieve this aim and to reduce risks associated with the use of medical devices, a management plan for defining the roles and procedures for evaluation, selection, purchasing, inspection and maintenance, training and disposal of medical equipment is needed (13-17). In the 2007-2008, Ontario, Canada hospitals had a total operating cost of \$20 billion. In contrast, in 2005-2006 these costs were only about \$17.5 billion, accounting for about 85% of total hospital spending (18). According to a survey on Victoria, Australian hospitals, two percent of medical equipment was in "poor" condition requiring immediate replacement, while 14 percent were in "fair" condition requiring replacement within one to three years. None of the hospitals had a comprehensive plan for identifying equipment needs (14).

Utility systems safety includes proper maintenance of electrical, water and other utility systems minimizing operating failures (1). Utility systems provide essential services in hospitals. To better assure safer facility care, minimize the risk of utility failure and improve the reliability of utility systems, management should have a plan for inspecting, testing and maintaining services in an efficient and cost effective manner (19-21). In 2002, US hospitals spent about \$1.67 on electricity and \$0.48 on natural gas per square foot (ft<sup>2</sup>).

Overall, in hospitals, between 61% and 79% of all energy is used for light, heat and hot water. In U.S. water used in hospitals and other health care facilities was 7 percent of the total water use in commercial facilities and in the past 10 years, the cost of water and wastewater services increased. These state shows that these systems are the best target for energy saving (22, 23). The aims of this study were to evaluate adherence of governmental and non-governmental hospitals found in Shiraz, Iran and to monitor facility management and safety

standards according to joint commission international accreditation "standards for hospitals" (1).

### Materials and methods

In this cross sectional study, we surveyed 22 of the 33 Shiraz hospitals including governmental and non-governmental facilities to evaluate adherence to facility management and safety standards as defined in joint commission international accreditation "standards for hospitals" (1).

A 74-item questionnaire was used, which originally had been developed according to standards guidelines. The questionnaire was composed of eight sections. The first section included 12 items related to leadership and planning, the second section included 9 items about safety and security, the third section included 3 items about hazardous material, the fourth section included 4 items related to emergency management, the fifth section included 11 items about fire safety, the sixth section included 11 items about medical equipment, the seventh section included 16 items about utility system and the last section included 7 items related to staff education. Responses of all questions included "Yes," "No" or "I don't know" with each having the same weighting. Validity of questionnaire employed responses made by experts.

The Cronbach's Alpha of questionnaire was 0.974. Due to type of questions and in order to increase the accuracy of results, we selected Matrons to fill the questionnaire. We provided questionnaires to Matrons of all 33 Shiraz hospitals. After about 6 months, we received back 22 questionnaires. We then compared results of 13 governmental and 9 non-governmental hospitals concerning their adherence to facility management and safety standards. Collected data were analysed by SPSS Version 15 software. Statistical significance was set at 0.05. A chi-square method was used to compare

adherence ratios among governmental and non-governmental hospitals.

## Results

In this study, the total response rate was about 66.66% (69.23% for non-governmental hospitals and 86.66% for governmental hospitals). There were four

military hospitals, while one was a social security institute. None of the five completed the questionnaire. 81.8% of governmental and 89.9% of non-governmental hospitals had a written plan concerning hospital risk areas ( $p=0.5$ ). In 14 hospitals there was a process for review and updating written plans (table 1).

**Table 1- Leadership and planning standards results**

	Standards	Adherence to Standards		No Adherence to Standards		P-Value
		Governmental Hospitals N(%)	Non-Governmental Hospitals N(%)	Governmental Hospitals N(%)	Non-Governmental Hospitals N(%)	
1	Knowledge of laws and regulations that apply to hospital facilities	10(76.9)	8(88.9)	3(23.1)	1(11.1)	0.49
2	Implementation of applicable requirements or approved alternatives	10(83.3)	7(77.8)	2(16.7)	2(22.2)	0.56
3	Facility inspection reports or citations required	8(61.5)	6(66.7)	5(38.5)	3(33.3)	0.81
4	A Written plan(s) existed about risk areas in hospitals	9(81.8)	8(89.9)	2(18.2)	3(33.3)	0.5
	Safety & Security	11(84.6)	7(77.8)	2(15.4)	2(22.2)	0.7
	Hazardous material	8(61.5)	5(55.6)	5(38.5)	4(44.4)	0.79
5	A written risk management plan(s) include:					
	Emergencies	8(61.5)	5(55.6)	5(38.5)	4(44.4)	0.79
	Fire safety	7(53.8)	6(66.7)	6(46.2)	3(33.3)	0.57
	Medical equipment	11(84.6)	6(66.7)	2(15.4)	3(33.3)	0.34
	Utility systems	12(92.3)	7(77.8)	1(7.7)	2(22.2)	0.35
6	Up to date written risk management plans present	7(53.8)	7(87.5)	6(46.2)	1(12.5)	0.23
7	Fully Implementation of written risk management plans	7(53.8)	6(66.7)	6(46.2)	3(33.3)	0.6
8	A process present to periodically review and update the written risk management plans	7(53.8)	4(50)	6(46.2)	4(50)	0.82
9	One or more persons had oversight concerning risk management plans	10(83.3)	7(87.5)	2(16.7)	1(12.5)	0.49
10	Established qualifications for managers is by experience or training	9(90)	5(62.5)	1(10)	3(37.5)	0.15
	Planning all aspects of the programs	4(30.8)	2(22.2)	9(69.2)	7(77.8)	0.67
	Implementing the programs	8(61.5)	4(44.4)	5(38.5)	5(55.6)	0.45
	Educating staff	9(69.2)	5(55.6)	4(30.8)	4(44.4)	0.53
11	Oversight programs concerning risk management plans includes:					
	Testing and monitoring the programs	8(61.5)	5(55.6)	5(38.5)	4(44.4)	0.79
	Periodically reviewing and revising the programs	7(53.8)	4(44.4)	6(46.2)	5(55.6)	0.68
	Annual reports about effectiveness of the programs	3(23.1)	3(33.3)	10(76.9)	6(66.7)	0.61
	Providing consistent and continues management	6(46.2)	5(55.6)	7(53.8)	4(44.4)	0.68
12	Use monitoring data to improve the program	7(70)	5(71.4)	3(30)	3(28.6)	0.87
	Total	64.89	63.48	33.11	36.52	0.62

Planning and implementation of safety and security standards present in plans, non-governmental hospitals performed better than governmental hospitals. However,

differences were not statistically significant ( $p=0.15$ ). Adherence to standards in governmental and non-governmental hospitals was 65.47% and 74.83% respectively (table 2).

**Table 2 – Safety and security standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value
	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )	
1 There is a program to provide a safe and secure physical facility	9(69.2)	7(87.5)	4(30.8)	1(12.5)	0.53
2 A safety and security program includes:	7(53.8)	8(100)	6(46.2)		0.01
Providing safety and security for all staff, visitor and vendors					
Identification of all security risk area	7(53.8)	5(62.5)	6(46.2)	3(37.5)	0.71
Providing safety and security during times of construction and renovation	6(46.2)	8(100)	7(53.8)		0.005
3 Monitor effectiveness of program for preventing injury to patients, staff and visitors	11(91.7)	8(100)	1(8.3)		0.42
4 Apply resources of hospitals in accordance with approved plans	10(83.3)	8(100)	2(16.7)		0.16
5 A documented, current, accurate inspections of physical facilities exists	10(83.3)	7(87.5)	2(16.7)	1(12.5)	1
6 There is a plan to reduce risks based on the inspections	11(84.6)	8(88.9)	2(15.4)	1(11.1)	0.47
7 Making progress in carrying out the plan	7(70)	7(87.5)	3(30)	1(12.5)	0.51
8 The organization budgets is based on applicable laws and regulations	5(38.4)	4(44.5)	8(61.6)	5(55.5)	0.45
9 The organization budgets specified for:	7(53.8)	8(88.9)	6(46.2)	1(11.1)	0.06
Upgrading or replacing systems					
Construction and renovation of buildings	10(76.9)	7(77.8)	3(23.1)	2(22.2)	0.96
Components needed for the continued operation of the facility	6(46.2)	3(33.3)	7(53.8)	6(66.7)	0.57
Total	65.47	74.83	34.53	25.17	0.15

Adherence of non-governmental hospitals to hazardous materials standards was 64.15% that significantly was better than governmental hospitals ( $p=0.023$ ) (table 3).

**Table 3 – Hazardous material standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value	
	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )		
1 A current list of hazardous materials		8(66.7)	5(71.4)	4(33.3)	2(28.6)	0.21
2 A current list of hazardous materials waste		8(72.7)	6(75)	3(27.3)	2(25)	0.11
3 A plan for management of hazardous material and waste includes:		4(30.8)	5(55.6)	9(69.2)	4(44.4)	0.24
Safe handling, storage and use						
Reporting and investigation of spills, exposures and other incidents		4(30.8)	4(44.4)	9(69.2)	5(55.6)	0.13
Proper handling and disposal of waste in a safe and legal manner		10(76.9)	7(77.8)	3(23.1)	2(22.2)	0.009
Proper protective equipment during use, spill or exposure		6(46.2)	5(55.6)	7(53.8)	4(44.4)	0.09
Identification of any documentation requirement (permits, licenses or regulations)		5(38.5)	6(66.7)	8(61.5)	3(33.3)	0.28
Labeling hazardous material and waste		3(23.1)	6(66.7)	10(76.9)	3(33.3)	0.43
Total	48.21	64.15	51.79	35.85	0.02	

Sixteen hospitals (30.8% of governmental and 62.5% of non-governmental) had a plan, which determined the type, likelihood and consequences of hazards ( $p=0.05$ ). In nine

hospitals, staff participated in at least one emergency preparedness test annually (table 4).

**Table 4 – Emergency management standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value
	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )	
1 Identification of the major internal and external disasters and epidemic events	8(61.5)	8(88.9)	5(38.5)	1(11.1)	0.22
2 A plans about response to disasters includes:					
Determining the type, likelihood and consequences of hazards and events	9(69.2)	7(77.8)	4(30.8)	2(22.2)	0.67
Determining the organization role in such events	8(61.5)	7(77.8)	5(38.5)	2(22.2)	0.27
Communication strategies for events	9(69.2)	6(66.7)	4(30.8)	3(33.3)	0.81
Management of resources during events	8(61.5)	5(55.6)	5(38.5)	4(44.4)	0.94
Management of clinical activities during events	8(61.5)	4(44.4)	5(38.5)	5(55.6)	0.68
Identification and assignment of staff roles during events	10(76.9)	8(88.9)	3(23.1)	1(11.1)	0.27
3 Test the plan annually	4(30.8)	5(62.5)	9(69.2)	3(37.5)	0.05
4 Participation of the staff in at least one emergency – preparedness test annually	5(50)	4(57.1)	5(50)	3(42.9)	0.47
Total	60.24	68.85	39.76	31.15	0.18

A program to ensure safety of facilities from fire emergencies existed in 12 hospitals. But, only 16.7% of governmental and 25% of non-governmental hospitals performed test fire

safety evacuations at least twice a year. Staff in ten governmental and eight non-governmental hospitals participated in at least one fire safety test per year (table 5).

**Table 5 – Fire safety standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value
	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )	Governmental Hospitals N( % )	Non-Governmental Hospitals N( % )	
1 A program to ensure about safety of all facilities from fire and non – fire emergencies	7(53.8)	5(55.6)	5(46.2)	4(44.4)	0.94
2 Implementation of this program to include all patient and staff works area	6(75)	5(71.4)	2(25)	2(28.6)	0.5
3 The fire management program include:					
Reduction of fire risks	5(38.5)	6(66.7)	8(61.5)	3(33.3)	0.1
Assessment of fire risks during construction	3(23.1)	4(44.4)	10(76.9)	5(55.6)	0.17
Early detection of fire and smoke	4(30.8)	5(55.6)	9(69.2)	4(44.4)	0.13
Abatement of fire and containment of smoke	4(30.8)	5(55.6)	9(69.2)	4(44.4)	0.13
Safe exit from the facilities in fire and non-fire emergencies	2(15.4)	4(44.4)	11(84.6)	5(55.6)	0.08
4 Inspect, test and maintain fire detection and abatement systems	7(58.3)	5(55.6)	5(41.7)	4(44.4)	0.61
5 Test fire safety evacuation plan at least twice a year	2(16.7)	2(25)	10(83.3)	6(75)	0.84
6 Train the staff to participate in the fire plan	9(75)	7(77.8)	3(25)	2(22.2)	0.89
7 Staff participate in at least one fire safety test per year	10(76.9)	8(88.9)	3(33.1)	1(11.1)	0.4
8 Document inspections, testings and maintenance of equipment and systems	6(50)	4(50)	6(50)	4(50)	0.66
9 Implement a policy or plan to eliminate or limit smoking	9(75)	7(77.8)	3(25)	2(22.2)	0.89
10 Applying smoking cessation plan for patients, families, visitors and staff	8(80)	7(100)	2(20)		0.16
11 Grant patient exceptions for smoking cessation plans	1(10)	2(22.2)	9(90)	7(77.8)	0.2
Total	47.28	59.4	52.72	40.6	0.08

All hospitals had a policy for regular inspection of medical equipment. Seventeen hospitals had qualified individuals for

providing maintenance services. The difference between governmental and non-

governmental hospitals was not significantly

different ( $p=0.44$ ) (table 6).

**Table 6 – Medical equipment standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value
	Governmental Hospitals N(%)	Non-Governmental Hospitals N(%)	Governmental Hospitals N(%)	Non-Governmental Hospitals N(%)	
1 Management of equipment throughout organization plan	11(84.6)	8(88.9)	2(15.4)	1(11.1)	0.59
2 A list of all medical equipment	12(100)	8(88.9)		1(11.1)	0.34
3 Regularly inspections of medical equipment	13(100)	9(100)			0.41
4 Testing of new medical equipment	12(92.3)	9(100)	1(7.7)		0.21
5 Preventive maintenance program present	13(100)	7(87.5)		1(12.5)	0.21
6 Presence of qualified individuals who provide maintenance services	13(100)	7(87.5)		1(12.5)	0.37
7 Collection and documentation of monitoring data for medical equipment program	11(84.6)	5(62.5)	2(15.4)	3(37.5)	0.35
8 Using monitoring data for purposes of planning and improvement	10(83.3)	4(57.1)	2(16.7)	3(42.9)	0.89
9 A product recall system for destroying products	7(63.6)	6(66.7)	4(36.4)	3(33.3)	0.89
10 An addressing policy for any use of product under recall	7(63.6)	7(77.8)	3(27.3)	2(22.2)	0.39
11 Implementation of addressing policy	7(77.8)	7(87.5)	2(22.2)	1(12.5)	0.33
Total	86.35	82.22	13.65	17.78	0.44

In all hospitals water and electrical power was available 24 hours a day, seven days a week. All hospitals had alternative resources for electrical power during emergencies. 83.3% of governmental and 100% of non-governmental hospitals had alternative resources for water during emergencies. However, these alternative resources underwent testing regularly in only 53.8% of

governmental, but in 100% of non-governmental hospitals ( $p=0.009$ ). Medical gases, ventilation and other key systems were regularly tested in 11 hospitals. Dialysis water was tested regularly in four governmental and three non-governmental hospitals. Adherence to utility system standards occurred in 74.08% of governmental and 82.94% of non-governmental hospitals ( $p=0.12$ ) (Table 7).

**Table 7 – utility systems standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value
	Governmental Hospitals N(%)	Non-Governmental Hospitals N(%)	Governmental Hospitals N(%)	Non-Governmental Hospitals N(%)	
1 Availability of potable water 24 hours a day, seven days a week	12(100)	9(100)			No resp
2 Availability of electrical power 24 hours a day, seven days a week	12(100)	8(100)			No resp
3 Identification of at risk areas when utility system fails	11(84.6)	8(88.9)	2(15.4)	1(11.1)	0.97
4 Seek reduction in the risk of utility systems failures	10(90.9)	6(75)	1(0.9)	2(25)	0.37
5 Plan alternative sources of water during emergencies	10(83.3)	8(100)	2(16.7)		0.1
6 Planning alternative sources of power during emergencies	13(100)	9(100)			No resp
7 Regularly test alternative sources of power and water	7(53.8)	8(100)	5(44.2)		0.009
8 Identification of medical gas, ventilation and other key systems	10(76.9)	9(100)	3(23.1)		0.08
9 Regularly inspect key systems	8(66.7)	5(62.5)	4(33.3)	3(37.5)	0.92
10 Regularly test key systems	6(50)	5(62.5)	6(50)	3(37.5)	0.51
11 Regularly maintain key systems	8(72.7)	5(62.5)	3(27.3)	3(37.5)	0.67
12 Improve key systems when needed	8(72.7)	5(71.4)	3(27.3)	2(28.6)	0.78
13 Regularly monitor water quality	7(53.8)	7(87.5)	6(46.2)	1(12.5)	0.01
14 Regularly test dialysis water	4(80)	3(75)	1(20)	1(25)	0.68
15 Regularly collect and document monitoring data of medical utility programs	5(45.5)	6(75)	6(54.5)	2(25)	0.01
16 Use monitoring data for planning and improvement	6(54.5)	4(66.7)	5(45.5)	2(33.3)	0.09
Total	74.09	82.94	25.91	17.06	0.12

Adherence to staff education standards was significantly better in non-governmental hospitals ( $p=0.05$ ) (table 8).

**Table 8 – Staff education standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value
	Governmental Hospitals N( %)	Non-Governmental Hospitals N( %)	Governmental Hospitals N( %)	Non-Governmental Hospitals N( %)	
1 A planned education program staff responsibilities and effectiveness	6(50)	5(62.5)	6(50)	3(37.5)	0.41
2 A planned education program for visitors, vendors and contract workers concerning their responsibilities and effectiveness	4(66.7)	4(80)	2(33.3)	1(20)	0.62
3 Ability of staff worker to describe their roles in:	9(75)	9(100)	3(25)		0.08
Eliminate, minimize or report safety and security risk	10(83.3)	7(77.8)	2(16.7)	2(22.2)	0.76
Procedures in handling and disposal of hazardous gases in emergencies	10(83.3)	8(88.9)	2(16.7)	1(11.1)	0.73
Internal and community emergencies and disasters	7(58.3)	8(88.9)	5(41.7)	1(11.1)	0.11
4 Training of staff to operate medical equipment appropriate to their job requirements	11(91.7)	9(100)	1(8.3)		0.4
5 Training of staff to maintain medical equipment appropriate to their job requirements	11(91.7)	8(88.9)	1(8.3)	1(11.1)	0.52
6 Testing of staff knowledge about their role in maintaining a safe facility	8(66.7)	8(88.9)	4(33.3)	1(11.1)	0.23
7 Documentation of staff training and testing	9(81.8)	8(88.9)	2(18.2)	1(11.1)	0.67
Total	74.85	86.48	25.15	13.52	0.05

Overall 65.17% of governmental and 72.79% of non-governmental hospitals adhered to facility management and safety standards.

Non-governmental hospitals were better but not significantly ( $p=0.22$ ) (table 9).

**Table 9 – Facility management and safety standards results**

Standards	Adherence to Standards		No Adherence to Standards		P Value
	Governmental Hospitals N( %)	Non-Governmental Hospitals N( %)	Governmental Hospitals N( %)	Non-Governmental Hospitals N( %)	
1 Leadership and planning	64.89	63.48	33.11	36.52	0.624
2 Safety and security	65.47	74.83	34.53	25.62	0.153
3 Hazardous material	48.21	64.15	51.79	35.85	0.023
4 Emergency management	60.24	68.85	39.76	31.15	0.184
5 Fire safety	47.28	59.4	52.72	40.6	0.089
6 Medical equipment	86.34	82.22	13.65	17.78	0.44
7 Utility system	74.08	82.94	25.91	17.06	0.121
8 Staff education	74.85	86.48	25.15	13.52	0.05
9 Total	65.17	72.79	34.83	27.21	0.221

## Discussion

Several approaches to assess the quality of hospital work, including process improvement, quality assurance, re-engineering and participative management are available (24). In this study parts of the Joint Commission International Accreditation "Standards for Hospitals" were used (1).

Results indicate that the mean compliance percentages of governmental hospital concerning standards in leadership and planning, safety and security, emergency

management, medical equipment, utility system and staff education ranged from 47% to 86%. However, hazardous material and fire safety compliance fell below 50%. The mean compliance percentages among non-governmental hospitals concerning the same standards were between 64% and 86%. Overall, level of participating Shiraz hospitals concerning facility management and safety standards were above of 50%. These results were similar to those of a previous study (25). Hospitals are expected to support services (physical facility, personnel, medical



equipment and resources) in a manner that meets global standards, especially during emergencies. Hospital facilities must develop and implement viable emergency preparedness plans. This includes an emergency preparedness plan/disaster manual that presents required topics and is useful to employees and healthcare workers during emergency situations (26).

Hazardous materials management is an important element of facility management and safety and health plans. A previous study concerning facility management quality surveyed Namazi hospital in Shiraz and reported that the weight of all hospital waste was 6.67 kg per occupied bed per day (kg/occupied bed/day) of which 73% was non-infectious with the remaining 27% considered as being infectious. After implementation of new guidelines, total waste was reduced to 5.92 kg/occupied bed/day with lower percentages (26% reduction) (5). Hospitals must implement new guidelines to improve hospital standards and training the personnel.

A study of the structure, process and performance of the emergency units of teaching hospitals of Tehran University of Medical Sciences, 77.7% were compliant with standards concerning space, facilities and equipment (27). Hospitals of Baqyatallah University of Medical Sciences had compliance scores of 79.01 (28). In the similar study in teaching hospitals affiliated with Uremia and Tabriz Universities of Medical Science, 50% of evaluated departments were substandard (29). In this study, 70.26% of participating Shiraz hospitals were generally in compliance with established safety and security standards. Results suggest that in order to provide better services, hospitals must know and apply established standards concerning structure and space in hospitals.

Research produced by Habibi et al. surveyed risk management in radiology units of Isfahan University of Medical Sciences Hospitals and found that personal protective equipment use was 51%, while physical safety levels

averaged 72% (30). In this study, 56.18% of hospitals were in compliance with hazardous materials standards. In order to reduce the risk of medical hazards and increase protection of staff, patients and visitors, we must have documented management plans and experienced personnel to monitor these plans regularly.

Salari et al. found hospitals disaster preparedness in selected Shiraz hospitals was 62.3% (31). In a similar research study, disaster management in Tehran hospitals was considered adequate (32). In this study, emergency management in 64.54% of hospitals was in accordance with Joint Commission International standards. Staff participation in at least one emergency preparedness test per year had a key role in emergency management compliance.

Fire management in 53.34% of hospitals complied with Joint Commission International standards. This suggests the need for further fire safety planning and better programs concerning fire management.

Sajadi and et al. shows that medical equipment management in Isfahan's hospitals with 50.48% of scores was acceptable (33). In this study, adherence of participating Shiraz hospitals to standards was 84.28%.

Our research indicated compliance with utility system standards was 78.51%.

Concerning staff education policies, adherence of Shiraz hospitals was 80.66%.

Overall, 68.98% of the involved Shiraz hospitals adhered to facility management and safety standards suggesting the need for improvement. For providing safe health care services and patient's satisfaction, we need to generate better plans, which comply with recent state, global standards and hospital's activities.

Unfortunately, similar studies of Iranian hospital facility management and safety standards compliance of hospitals are limited. This makes it difficult to compare and analyze the results of this study within the context of a large data set.

In this study, questionnaires were completed hospital matrons, thus only their knowledge

and opinions about hospital performance was analyzed. Perhaps, opinions of hospital staff may have been different. However, matrons should be aware about all aspect of their hospitals as well as current safety regulations and guidelines. Also, several hospitals submitted incomplete surveys, which may suggest that matrons may have not consulted with all affected areas and/or departments. Further, more complete studies are needed.

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