National Survey of Hospital Medication Safety Practice during Mass Gathering (Hajj-2016) in Makkah, Saudi Arabia: Environmental Culture and Staff Competency

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Abstract

Objective: To explore the national survey of hospital medication safety practice during mass gathering (Hajj -2016) in Makkah, Saudi Arabia: Environmental factors and staff competency, the finding of ISMP (2011) self-assessment of medication safety at the hospitals. **Methods:** It is 15 days cross-sectional national survey of hospital medication safety at Makkah region. The survey modified from Institution of Safe Medication Practice (ISMP) self-assessment of hospital medication safety. It consisted of a demographic section and ten domains with 270 questions. The ten areas included patient information, drug information, communication of medication orders, drug preparation, medication distribution, medication devices, work environment, staff competency, patient education, quality process with risk management domain. The 5-points Likert response scale system used. The survey distributed to sixteen directors of hospital pharmacy during mass gathering Hajj-2016. The medications safety officer at Makkah region distributed the questionnaire and made follow up on a daily basis used physical visiting and through the telephone call. **Results:** The survey distributed to sixteen hospitals, the response rate, was eleven hospitals (68.75%). The total score of all ISMP-self assessment of medication safety was 3.39 $\pm$ 0.51 (67.68 %) with CI (3.2-3.6) $P < 0.05$. The average rating of environmental factors, workflow, and staffing were 3.93 (78.6 %) while the mean score staff competency and education domain at all hospital were 3.69 59.40%). The highest score of both domains was a standard lighting adequate to read labels and other important drug and patient information in pharmacies 4.70 (94 %). The lowest score of both domains was The organization provides formal teamwork training to all staff 2.91 (58.2%). **Conclusion:** The medication safety related environmental factors, workflow, and staff competency key element during mass gathering Hajj period was right level. The levels of both domains required to continue in the coming next years with focusing on using the new technology of pharmacy practice at hospitals and annual assessment medication safety culture during mass gathering Hajj period at all hospitals in Makka region, Saudi Arabia highly recommended.

Key words: Medication Safety, Hajj, Environmental, Staff, Competency, Ministry of Health, Saudi Arabia.

INTRODUCTION

General Administration of Pharmaceutical Care (GAPC) at the ministry of health in Saudi Arabia released medical and non-medical equipment pharmacy guideline, national pharmacy competency system, and a new standard of pharmacy manager requirements for hospitals and primary care centers.^[1-3] All those programs complemented to the national medication safety program.^[4] The supporting program increased medication safety weather and prevented drug related problems of the patient at any specialty of the institution. All previous program applied during mass gathering hajj period.^[5] It seldom to find local studies about pharmacy competency or environmental factors or pharmacy workforce related to medication safety in Saudi Arabia. Institute for Safe Medication Practice (ISMP) in the United States of America (USA) had released excellent tools to measure the medication safety and relationship with environmental workflow and staff competency.^[6] The first issues were in 2000 and then updated in 2011. The ISMP did studies to measure in reality at USA hospital those key elements. The authors found the environmental factors, workflow, staffing key element changed from 70% to 77%, and staff competency and education key element improved from 53% to 64%.^[7-9] The authors are not familiar with any published study about those key elements and medication safety relationship in Saudi Arabia, Gulf or even Middle East countries, especially during mass gathering hajj period. The objective of our study to explore the medication safety practice during mass gathering (Hajj -2016) in Makkah hospitals, Saudi Arabia: Environmental factors and staff competency, the finding of ISMP (2011) self-assessment of medication safety at the hospital.

METHODS

It is a fifteen days cross-sectional national survey of hospital medication safety at Makkah region. The survey modified from Institution of Safe Medication Practice (ISMP) self-assessment of hospital medication safety. It consisted of a demographic section and ten domains with 270 questions. The ten areas included patient information, drug information, communication of drug orders and other drug information, drug Labeling and Packaging and Nomenclature, drug standardization, storage and distribution, medication devices acquisition, use, and monitoring. The environmental factors, workflow, and staffing, staff competency, patient education, quality processes and risk management

domain. It contained a twenty core sections included essential patient information, essential drug information, a controlled drug formulary system, methods of communicating drug orders, strategies to minimize the possibility of errors. The clear labels that identify drugs are on all drug containers, standardized of IV solutions, drug concentrations, doses, and administration times. A safety-supportive culture, practitioners are stimulated to detect and report adverse events, errors, hazards, and observed at risk behavior, and redundancies that support a system of independent double check at risk. The practitioners receive sufficient orientation to medication use; the practitioners involved in medication use provided with ongoing education about medication error prevention and the safe use, patients, are included as active partners. Medications provided to patient care units safely and securely, the unit stock, is restricted, hazardous chemicals safely sequestered, the potential for human errors, medications are prescribed, transcribed, prepared, dispensed, and administered within an efficient and safe workflow. The complement of qualified, well-rested practitioners matches the clinical workload without compromising patient safety.

The 5-points Likert response scale system used. The scoring key identified as number (1) equal to (A): No activity to implement, (2) equal to (B): Considered, but not implemented, (3) equal to (C): partially implemented in some or all areas. (4) Equal to (D): Fully implemented in some areas, and (5) equal to (E): Fully implemented throughout. The survey conducted at a permanent and temporary hospital located at Makkah and holy places. Most of the hospital had outpatient, and emergency services, some of them had critical care section for adults, pediatrics, and internal medicine.

The hospital provided emergency and outpatient pharmacies, inpatient pharmacies. Some of the hospitals had intravenous admixture and total parenteral services and drug information services. Structural Clinical pharmacy services missed at most of the hospitals except critical care pharmacy and stewardship antimicrobial program at permanent hospitals, some essential Clinical pharmacy program; pain management, and anticoagulation program not existed at all hospital. The survey distributed to directors of hospital pharmacy during mass gathering Hajj-2016.

The medications safety officer at Makkah region distributed the questionnaire and made follow up on a daily basis used physical visiting and through the telephone call. The study made as an electronic format,

RESULTS

and it analyzed through survey monkey system and Microsoft Excel version ten. The authors suggested some solution to improve the scoring medication safety culture and the finding of ISMP self-assessment, the 5-points Likert scale system with high priority or opportunity to implement (5) and low priority or opportunity to implement (1). Those suggestions based on General Administration of Pharmaceutical strategic goals and Saudi Central Board of Accreditation for Health Care Institutions (CBAHI) standards in Saudi Arabia. The ten domains divided into for several parts for analysis, discussion, and solutions. Part one: patient information, part two: drug information, part three: medication preparation and dispensing (communication of drug orders and other drug information, drug Labeling and Packaging and Nomenclature). The part four: medication administration (drug standardization, storage and distribution, medication devices acquisition, use, and monitoring), part five: environmental factors, workflow, and staffing, staff competency, and part six: patient education, quality processes, and risk management. The study explored the part number five; it is a finding from ISMP (2011) medication safety at a hospital in Makkah.

The survey distributed to sixteen hospitals, the response rate, was eleven hospitals (68.75%). The number of permanent hospitals was six (54.45%) located at Makkah city while the temporary hospitals were five (45.45%) located at holy places. Of those four (36.4%) hospitals bed size was (100-199) and 3 (27.3%) bed size (200-299). The number of hospitals accredited by Saudi Central Board of Hospitals Accreditation (CIBAHI) was four (36.4%) while three hospitals (27.3%) accredited by USA International Joint Commission and CIBAHI. The total number of prescriptions was (120,598). Of those (72,627) were Ambulatory care prescriptions, while (43,242) were Emergency Prescriptions, and (4,729) were inpatient orders. The total number of the pharmacist was (180) while pharmacy technician (83) and a number of clinical pharmacists not reported as explored in Table 1.

The total score of all ISMP-self assessment of medication safety was 3.39 ± 0.51 (67.68 %) with CI (3.2-3.6) $P < 0.05$ and range (2.75 – 3.93). 2. The average score of Environmental Factors, Workflow, and Staffing were 3.93 ± 0.44 (78.6 %) with CI (3.73-4.13), $P < 0.05$ and range (3.36 – 4.70). The average score Staff competency

Table 1: Type of hospital services and pharmaceutical care section of surveyed hospitals in Makkah.

No and Hospitals	Location	Hospital Type	No of Beds	Accreditations	No of Pharmacy Technician	No of Pharmacist	No of Clinical Pharmacist	No of OPD Prescriptions		No of Emergency Prescriptions		No of Inpatient Prescriptions	
								Pilgrims	Non- Pilgrims	Pilgrims	Non- Pilgrims	Pilgrims	Non- Pilgrims
1. Mena-1	Mena	Temporary	100-199	Non	9	1	NR	6,180	500	992	67	179	6
2. Mena-2	Mena	Temporary	100-199	Non	18	1	NR	15,203	330	1,661	113	612	17
3. Mena-3	Mena	Temporary	200-299	Non	19	2	NR	12,286	1,016	1,281	99	350	22
4. Arafat-1	Arafat	Temporary	200-299	Non	10	1	NR	527	73	272	22	129	6
5. Arafat-2	Arafat	Temporary	100-199	Non	8	1	NR	4,073	155	328	13	192	6
6. M-1	Makkah	Permanent	300-399	CIBAHI	12	9	NR	22	650	244	6,135	31	664
7. M-2	Makkah	Permanent	200-299	CIBAHI - JCI	23	10	NR	34	3,208	185	9,408	46	728
8. M-3	Makkah	Permanent	400-599	CIBAHI - JCI	60	24	NR	6,706	15,222	4,033	4,026	428	490
9. M-4	Makkah	Permanent	50-99	JCI	7	2	NR	0	0	1,754	1,159	55	11
10. M-5	Makkah	Permanent	100-199	CIBAHI	4	2	NR	1,037	NR	3,353	NR	29	NR
11. M-6	Makkah	Permanent	300-399	CIBAHI	10	30	NR	2,640	2,765	2,988	5,109	411	317
Total					180	83		48,708	23,919	17,091	26,151	2,462	2,267
Total no of prescriptions =120598													
No.: Number, NR: Not reported													

Table 2: The scores key elements of ISMP medication safety hospitals in Makkah

Core #	Core Characteristic	Mean score	SD	Range	Percent	SD %	Range %	U S A , 2 0 0 0 Scores %	U S A , 2 0 1 1 Scores %
VII	Environmental Factors, Workflow, and Staffing	3.93	0.44	3.36 – 4.70	78.60	8.80	67.20 – 94.00	70.00	77.00
12	Efficient and safe workflow in increase distraction-free environment with adequate space and lighting	4.01	0.527	3.45 – 4.70	80.20	10.54	69.00 – 94.00	69.00	74.00
13	The complement of qualified, well-rested practitioners matches the clinical workload without compromising patient safety	3.86	0.367	3.36 – 4.36	77.20	3.67	67.20 – 87.20	71.00	80.00
VIII	Staff competency and education	3.69	0.445	2.91 – 4.40	73.80	8.90	58.20 – 88.00	53.00	64.00
14	Sufficient orientation and baseline and increase annual competency evaluations	3.67	0.51	2.91 – 4.40	73.40	10.20	58.20 – 88.00	56.00	67.00
15	Ongoing education about medication increase error prevention and safe use of drugs	3.72	0.36	3.18 – 4.18	74.40	7.20	63.60 – 83.60	49.00	59.00

Table 3: The highest and lowest scores items of domain Environmental Factors, Workflow and Staffing

VII: Environmental Factors, Workflow, and Staffing										
ISMP No.	Key elements	A 1	B 2	C 3	D 4	E 5	R a t i n g Average	Percent	Response Count	
	Core # 12: Efficient and safe workflow in increase distraction-free environment with adequate space and lighting									
	The highest scores items									
149	Lighting is adequate to read labels and other important drug and patient information	0	0	1	1	8	4.70	94.00	10	
157	Practitioners who administer medications prepare and/or select one patient's medications at a time, immediately before administering the drug.	1	0	0	0	9	4.60	92.00		
	The lowest scores items									
154	Areas, where drug orders transcribed and/or entered into computer order entry systems isolated and relatively free of distractions, interruptions, and noise	3	0	1	1	5	3.50	70.00	10	
158	When new construction or renovation of an existing area when prescribed, dispensed, stored, or administered planned, an interdisciplinary group of practicing staff involved in medication use	4	0	0	1	6	3.45	69.00	11	
	Core # 13: The complement of qualified, well-rested practitioners matches the clinical workload without compromising patient safety									
	The highest scores items									
162	Schedules and workload permit practitioners involved in the medications process	1	0	1	1	8	4.36	87.20	11	
163	An effective backup plan established for days when staffing is short due to illness, vacation, educational absences, and fluctuations in patient acuity and workload.	1	0	1	2	7	4.27	85.40	11	
164	Pharmacists and pharmacy technicians believe that staffing patterns in their department are adequate to provide safe pharmaceutical care on most days.	1	0	2	0	8	4.27	85.40	11	
	The lowest scores items									
167	The organization has an adequate complement of well-qualified and trained nurses to provide care to specialty populations	3	1	0	2	5	3.45	69.00	11	
166	The pharmacy department has an adequate complement of trained and dedicated personnel to meet the medication-related technology requirements	4	0	0	2	5	3.36	67.20	11	
	<i>answered question 11 and question 0</i>									

and education domain at all hospital were 3.69+/- 0.45(59.40%) with CI (3.51 - 3.87), $P < 0.05$ and range (2.91 – 4.40) as explored in Table 2.

The highest score of the Environmental Factors, Workflow, and Staffing was a Standard Lighting

adequate to read labels and other important drug and patient information in pharmacies 4.70 (94 %). The lowest score was the pharmacy department has an adequate complement of trained and dedicated personnel to meet the medication-related technology requirements 3.36 (67.2 %), and all detail results with

Table 4: The highest and lowest scores items of domain staff competency and education.

VIII: Staff competency and education									
ISMP No.	Key elements	A 1	B 2	C 3	D 4	E 5	R a t i n g Average	Percent	Response Count
	Core # 14: Sufficient orientation and baseline and increase annual competency evaluations								
	The highest scores items								
170	A defined period of orientation and training of agency staff required before they can work independently.	0	1	1	1	7	4.40	88.00	10
172	During orientation, the staff participating in the medication use process, receive information about the hospital's actual error experiences as well as published errors	0	1	2	1	6	4.20	84.00	10
	The lowest scores items								
173	During orientation, nurses spend time in the pharmacy to become familiar with the order entry and/or verification process, drug preparation and dispensing, availability of drug information resources	2	2	2	1	3	3.10	62.00	10
182	The hospital information technology department/staff includes personnel with specialty training in clinical informatics	3	0	3	1	3	3.10	62.00	10
183	The organization provides formal teamwork training to all staff	4	0	3	1	3	2.91	58.20	11
	Core # 15: Ongoing education about medication increase error prevention and safe use of drugs								
	The highest scores items								
185	Pharmacists routinely provide nurses and other practitioners who administer medications with valuable information about non-formulary drugs before dispensing the products to the patient.	1	0	2	1	7	4.18	83.60	11
184	Practitioners educated about new drugs added to the formulary and associated protocols/guidelines and restrictions before the drugs used in the hospital.	1	0	1	3	5	4.10	82.00	10
	The lowest scores items								
194	Senior leaders, management, and frontline staff receive formal training in identifying risk within the system	4	0	1	2	4	3.18	63.60	11
192	Simulations of error-prone conditions used as methodologies to orient and educate practitioners and other staff about medication/patient safety.	3	1	2	1	4	3.18	63.60	11
	answered question 11 and skipped question 0								

all cores explored in Table 3. The highest score of Staff competency and education key element was a defined period for orientation and training of agency staff is required before they can work independently 4.4 (88%). The lowest score was the Simulations of error-prone conditions used as methodologies to orient and educate practitioners 3.18 (63.6%) and all detail results with all cores explored in as explored in Table 4.

DISCUSSION

The general administration of Pharmaceutical Care established several programs including environmental culture and staff competency.^[1-10,11] It is a part of key elements of ISMP self-assessment of medication safety.^[7] The pharmacy administration formulated social pharmacy committee with a membership of each region representative. The committee has a strategic plan for next years and implemented several projects. For instance; the pharmacist job satisfaction, patient pharmacy satisfaction system, pharmacy patient's bill of rights as part of environmental factors started in 2014.^[12-14] Another project related to pharmacy education

was the hospital pharmacist competency or primary care pharmacist competency system, as part of staff competency released in 2014. All staff competency and satisfaction elements should report the results from all hospital pharmacies and primary care center pharmacies to MOH on an annual basis. The relationship between the environmental factors or staff competency and medication safety measured by ISMP self-assessment of medication safety. The authors used the tools at holy places and Makkah city to measure them.

The score of environmental factor result of our study was more than Vaida AJ *et al.* study in 2000 and the same results by Alen 2011.^[8] The finding expected that is due general Hajj executive committee and Medical affairs in Myakka city had a very comprehensive preparatory program before Hajj for all healthcare system during mass gathering including hospitals. The pharmacy services were one of the major and essential parts of the services. The staff competency results of our study were better than a study by Vaida AJ *et al.* It is because the MOH had a very essential continuous medical education program for all health care professional, physicians, pharmacists, and nurses.^[7]

Table 5: Recommendation to improve the items of domain environmental factors and staff competency and education during mass gathering Hajj period.

No.	Strategic Goals	CBAHI standards	Suggestion for improvement during mass gathering Hajj	Propriety scores	Opportunity scores
1	Pharmacy computerization				
1.1	Strategic Goal 3	MM.3	Expand electronic CME lecture for all pharmacist and clinical pharmacist	3	5
2	Pharmacy human resources				
2.1	Strategic Goal 2	MM.2 MM.3	Increase pharmacist workforce during mass gathering hajj period at 2-3 three times incremental of MOH standards	5	3
2.2			Increase number of qualified, trained nurses	5	3
2.3			Implement education courses for pharmacist and nurses of new technology system	5	5
2.4			Increase number of qualified clinical pharmacist with different specialties	5	3
2.5			Apply the mass gathering pharmaceutical care orientation program for pharmacist, pharmacy technician, and clinical pharmacist	5	5
2.6			Apply the mass gathering Pharmaceutical Care orientation for physician and nurse	5	5
2.7			Continue with basic medication safety to Physician and nurse and pharmacist	5	5
3	Pharmacy innovation and empowering culture				
3.1	Strategic Goal 4	MM.5 MM.25 MM.35 MM.37 MM.39	Open position ambulatory care clinic for pharmacist for diabetes and asthma	3	3
3.2			Implement clinical pharmacy program for critical care, and infectious diseases	4	4
4	Pharmacy clinical audit				
4.1	Strategic Goal 5	MM.6 MM.12 MM.40 MM.41	Annual survey of ISMP with emphasis on pharmacy environment and staff competency	5	5
4.2			Annual report of pharmacy staff competency	4	4
4.3			Annual report of pharmacy environment culture	5	4
4.4			Implement the pharmacy staff competency key performance indicators	4	3
4.5			Implement pharmacy environmental culture and design key performance indicators	5	5
4.6			Implement the competency indicators of type clinical pharmacist	4	4

Recently, MOH changes all educational program as through the internet.^[15] The authors revised all statement of environmental factors and staff competency key elements and suggested several points to improve both elements and meet pharmacy strategic goals and Saudi center of healthcare organizations accreditation (CIBAHI), priorities, and facilities during implementation. For instance, increase pharmacist workforce during mass gathering hajj period at 2-3 three times incremental of MOH standards, implement pharmacy staff competency key performance indicators, and implement the competency indicators of type clinical pharmacist, for more detail of recommendation as explored in Table 5.

CONCLUSION

The environment factors and staff competency key elements acceptable scoring level. It highly recommended continuing improving the medication safety culture. The ISMP is good measurements

tools of medication safety and environmental culture relationship. In addition to medication safety and staff competency relationships.

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CONFLICT OF INTEREST

None

ABBREVIATIONS USED

GAPC: General administration of Pharmaceutical Care, CBAHI: Saudi Central Board for Accreditation for Health Care Institutions, MOH: Ministry of Health, ISMP: Institution Safe Medication Practice.

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