

# Effectiveness of an Educational Program on Nurses' Knowledge Concerning Medication Error at Teaching Hospital in AL-Nasiriyah City

Hatem Mohammed Ltheeth<sup>1</sup>, Sabah Abas Ahmed PhD<sup>2</sup>

<sup>1</sup>Adult Health Nursing Department, University of Baghdad, Nursing College

<sup>2</sup>Professor, Adult Health Nursing Department, University of Baghdad, Nursing College

**Abstract:** *Background:* Medication errors are the main factors endangering the patient safety. Patient safety is a significant challenge facing health care system today. The aim of this study was to assess the effectiveness of educational program on nurses' knowledge concerning medication error to reduce medication errors. *Methods:* A quasi-experimental in the bigger teaching hospital in AL-Nasiriyah city during period between 12 February 2017 to 25th April 2017 have been build up the program by the researcher in order study shamble, a non-probability "purposive sample" of (180) nurse were working in AL-Nasiriyah city hospitals, It is collected from medical, surgical, emergency department and intensive care unit (90) nurses to control study 90 to study group. divided in to two groups (90) study group and (90) control group. Data were collected by utilizing the following Structure Questionnaire to assess nurses' knowledge concerning medication errors contain the demographic data, general basic information about medication and Ten drug right it is composed from 39 questions. Then Reliability of the Instrument and Validity of the Study Instrument by the experts

**Keywords:** nursing; education, Safe medication administration, medication administration error, patient safety

## 1. Introduction

Medications have significant benefits for our life which lead to significant reduction in morbidity and mortality (Alwani, 2012). Drug use is a complex process and there are many drug related challenges at various levels, involving prescriber, pharmacists and patients (Vijay Roy & Basak, 2004). Medication error is one main component for safety healthcare services Clinically significant medication error was defined as "a medication error with the potential for causing a patient discomfort or jeopardizing a patient's health and safety" (Barker et al., 2002). Patient's safety is a major public health concern and a requirement for quality of health care services (Cook & Montori, 2004). While medication misadventure can occur anywhere in the health care system from prescriber to dispenser to administration and finally to patient use, the simple truth is that many errors are preventable, and pharmacists and /or doctors assume active role in appropriate use of drugs (Van Harten, 2009). Medication error may be related to knowledge, professional practice, patients related factors health care products, procedures, and systems, including prescribing; order communication; drug- labeling, packaging, lack of knowledge about drug therapy, misinterpretation of verbal orders and compounding; dispensing; distribution; administration; education; monitoring; and use (Johnson & et al, 2011). A medication error mainly occurs in the form of wrong time, wrong rate, wrong dose and wrong drug to patient (Weant & et al, 2014). Reduce medication errors and increase patient safety represents a central focus of hospitals quality improvement and risk management (Al-Youssif & et al, 2013). It is based on design and implements more error-resistant systems and creates an environment in which staff can learn from failure - a safe, non- penal environment that supports staff discussion of errors, their causes, and ways to prevent them (Hughes & Blegen, 2008). Medication administration process is an everyday part of nursing

practice and one of the most important duties of nurses (Abusaad & Etawy, 2015 and Johari & et al, 2013). Safe medication administration is important to nurses, doctors, administrators, educators, and patients.

There are five processes critical to safe medication administration include :-

- 1) Compare medication to medication administration record
- 2) Keep medication labeled throughout process.
- 3) Check two patient's identifiers.
- 4) Explain drug to patient as appropriate.
- 5) Chart immediately after administration (miglani, 2015 and ching & et al, 2013).

In this process it is very important to study the behavior of the nurses when the nurses perform mal behavior on the process, it is said to be noncompliance, neglect of action, result in medication administration errors. Improving the medication administration process and controlling interruption can give the nurses more time to be at the bedside, reducing medication errors, and promoting patient safety (Arnodo, 2014). Pharmacy entails a health science specialty which embodies the knowledge of pharmacology, toxicology, pharmacokinetics and therapeutics for the care of patients (Gurwitz & et al., 2000). Recognizing the importance of ensuring patient safety,

## 2. Methodology

A descriptive study was carried out 12 February to 25 may 2017. Random sample comprised of (180) nurses was divided in to two groups, study group consisted of (90) nurses exposed to the nursing educational program and control group consisted of (90) nurses were not exposed to the program.

The selection of present sample beside on special criteria which includes nurses who are working at the medical, surgical emergency department and intensive care unit , male and female nurses, nurses that should have at least one year of experience or more, in deferent education level of nurses, Nursing Institute, Secondary Nursing School, Nurses who work in the morning shift only. The educational program was design to provide nurses knowledge ;general basic information about drug copy medication record , medication error , transcription of medication record ,prescription dispensing abbreviation ten drug right . The study instrument was nurses knowledge concerning medication error develop by researcher for the purposive of the study it was consist of two part : self-administration sheet related to demographic nurses and nurses knowledge regarding (medication error).

Questionnaire sheet related to nurses' knowledge carried out during the morning shift. nurses knowledge was consist of (49) item divided in two parts.

Demographic data. It composed of (9) items. Part two deals the nurses' knowledge ( 39) items, The data of present study were analysis through statistical package social science. descriptive statistical approach that include (Frequencies, Percentage, and Cumulative Percentages, Mean of Score, Standard Deviation ) and Inferential statistical approach (Chi-Square test, Fisher, ACNOVA). Results determines as highly significant at (P < 0.001) significant at (P < 0.005) and non-significant (P > 0. 05)

### 3. Result

The present study revealed that the nurses' knowledge was low and increased immediately after intervention with statistical significant difference compared to pre intervention. b) There was improved of nurses' knowledge , about medication administration error after intervention than pre intervention with a highly statistically significant difference compared to pre intervention.

**Table 1:** Distribution of The Study Sample ( Study and Control Groups ) According to Demographical Characteristics

Variables	Characteristics	Study Group		Control Group		C.S.
		Freq.	%	Freq.	%	P-value
Age (years)	20-25	39	43.3	38	42.2	t-test p=0.726
	26-30	22	24.4	20	22.2	
	31-35	4	4.4	6	6.7	
	36-40	12	13.3	14	15.6	
	41-45	4	4.4	3	3.3	
	46-50	6	6.7	5	5.6	
	≥ 51	3	3.3	4	4.4	
	Total	90	100	90	100	
	$\bar{x} \pm S.D.$	30.74 ± 10.18		29.08 ± 9.08		
Gender	Male	38	42.2	41	45.6	FEPT
	Female	52	57.8	49	54.4	P=0.846
	Total	90	100	90	100	NS
Level of Education	Joiner nurse	27	30	33	36.7	t-test
	Nursing Institute	52	57.8	47	52.2	P=0.295
	College of Nursing	11	12.2	10	11.1	NS
	Total	90	100	90	100	
Current work place	Emergency	12	13.3	15	16.7	t-test
	Medical ward	30	33.3	27	30	P=0.530
	Surgical ward	21	23.3	24	26.7	NS
	I.C.U	27	30	24	26.7	
	Total	90	100	90	100	

Table -1 reveals that the majority 39(43.3%) of nurses in the control group are within the age group (20 - 25) years while 38(42.2%) of nurses in the study group and the majority for both groups: the study group 52(57.8%) and control group 49(54.4%) have been female.

Concerning the level of education, the majority of the nurses 52(57.8%) in the study and 47(52.2%) of the control group are both nursing Institute. In relation to the current work place, 30(33.3%) of nurses in the study group and 27( 30%) of nurses in the control groups of nurses were working in medical ward. Regarding subject of number of years in the health field, the majority of both groups of nurses have (1-5 years) of experience 52(57.8%) of nurses in the study group and 47 (52.2%) of nurses in the control group.

Number of years in current work place, the majority of both groups are nurses have (1-5 years) of experience in current work place 52(57.8%) and 42 (46.7%) of nurses in the study and control groups respectively. Concerning number of years in military branch, the majority of both study and control groups of the nurses have not service in military branch 79(87.8%), 71(78.9%) respectively.

Concerning number of courses regarding drugs administration,18(60%) of nurses in the study group were 62(68.9%) of nurses and 57(63.3%) in the control group have not had training courses .Regarding to subject of the transition to another department didn't included drug administration , the majority of both study and control groups of the nurses disagree transition to another

department88(97.8%), 82(91.1%) respectively, and Finally the majority of the nurses have not an outpatient clinic after

the official workin study group 66(73.3%) and71(78.9%) in the control group

**Table 2:** Comparison between Two Periods (pre and post test-1 and post test 2) the Nurses' Knowledge Concerning Medication Errors of the Study Group

Domains Related to Nurses' Knowledge Concerning Medication Errors	Pre-Test		Post 1-Test		Post 2-Test		ANOVA	
	M.S.	Ass.	M.S.	Ass.	M.S.	Ass.	P <sub>value</sub>	C.S.
1-Basic information about medications	0.36	F	0.97	S	0.99	S	0.000	HS
2- Information about medication errors and writing of the medication order (prescription)	0.52	S	0.98	S	0.91	S	0.000	HS
3-Errors in copying the recipe or in the transfer process from one page to another	0.38	F	0.84	S	0.99	S	0.000	HS
4-Errors in the distribution and dispensing of medication	0.41	F	0.94	S	0.97	S	0.000	HS
5-Drugs rights	0.40	F	0.94	S	0.98	S	0.000	HS
6-Right patient	0.47	F	0.92	S	0.98	S	0.000	HS
7-Right dose ,The right dose is means avoid giving a patient the wrong dose of medicine	0.30	F	0.93	S	0.96	S	0.000	HS
8-Right time	0.53	S	0.91	S	0.97	S	0.000	HS
9-Right Administration	0.60	S	0.98	S	0.97	S	0.000	HS
10-Right effect	0.28	F	0.93	S	0.98	S	0.000	HS
11-Right education	0.48	F	0.94	S	0.98	S	0.000	HS
12-The patient has the right to reject of taking medication	0.25	F	0.93	S	0.98	S	0.000	HS
13-Right evaluation	0.40	F	0.93	S	0.97	S	0.000	HS
14-There are many of medication required further investigation before prescription and administration due to they cause dysfunction on the cardiac work	0.54	S	0.95	S	0.98	S	0.000	HS
15-Mix up of medication	0.24	F	0.94	S	1.00	S	0.000	HS

M.S. =Mean of score , SD = Standard Deviation , Ass.= Assessment ,p: probability, C.S. : Comparison, Significant , HS : Highly Significant at P < 0.01, S:Success, F: Failure .

The table- 2 indicates that there are highly significant differences between three period (pre, post-1 and post-2

tests ) at the study group in all domains of nurses' knowledge concerning medication errors;when they are analyzed by ANOVA.

**Table 3:** Distribution of the Levels of Assessment through the "Mean of Score" between the Study and Control Groups at Three Periods( Pre; Post-1 and Post-2 ) Tests Related to the Nurses' Knowledge

Periods	Level of Assessment	Study Group		Control Group	
		Frequency	Percent	Frequency	Percent
Pre-test	( 0 - 24 ) Low Low : 1	0	0.00	0	0.00
	( 25 - 49 )Low High:2	75	83.3	73	81.1
	( 50- 74 ) High Low : 3	15	16.7	17	18.9
	( 75 - 100 ) High High : 4	0	0.00	0	0.00
	Total	90	100.0	90	100.0
	$\bar{x} \pm S.D.$	0.41 $\pm$ 0.095		0.42 $\pm$ 0.096	
Post 1-test	( 0 - 24 ) Low Low : 1	0	0.00	12	13.3
	( 25 - 49 )Low High:2	0	0.00	67	74.4
	( 50- 74 ) High Low : 3	1	1.1	11	12.2
	( 75 - 100 ) High High : 4	89	98.9	0	0.00
	Total	90	100.0	90	100.0
	$\bar{x} \pm S.D.$	0.93 $\pm$ 0.069		0.39 $\pm$ 0.108	
Post2-test	( 0 - 24 ) Low Low : 1	0	0.00	2	2.2
	( 25 - 49 )Low High:2	0	0.00	20	22.2
	( 50- 74 ) High Low : 3	0	0.00	37	41.1
	( 75 - 100 ) High High : 4	90	100.0	31	34.4
	Total	90	100.0	90	100.0
	$\bar{x} \pm S.D.$	0.97 $\pm$ 0.031		0.47 $\pm$ 0.177	

$\bar{x} \pm S.D.$ :=Arithmetic Mean ( $\bar{x}$ )and Std. Dev. (S.D.),Level of evaluation: (1-1.67) = Low ;( 1.68-2.33) = Moderate; ( 2.34-3.00) = High

This table reveals low high level of assessment to the mean of score 75(83%)of suggested group of assessment (as in 25-49):2 for pre-test of study group with mean score and standard division (as in 0.41 $\pm$ 0.095) ; while 73(81.1%) of the same suggested group of assessment (as in 25- 49):2 for pre-test of control group with mean score and standard division( as in 0.42 $\pm$ 0.096).

This table, also, shows high high level of assessment 89(98.9%) of suggested group of assessment (as in 75-100):3 for post-1 -test of study group, with mean score and standard division (as in 0.93 $\pm$ 0.69); while 67(74.4%) of suggested group of assessment for post-1 -test of control group remain in the same suggested group of assessment(as in as in 25- 49):2 of pre-test of control group, with mean

score and standard division (as in  $0.39 \pm 0.108$ ). Regarding subjects of post-2 test of study group: 90(100%) of suggested group of assessment (as in 75-100): 4, with mean score and standard division (as in  $0.97 \pm 0.31$ ); while control group

37(41.1%) of suggested group of assessment (as in 50-74): 3, with mean score and standard deviation (as in  $0.47 \pm 0.177$ ).

The post-test showed

**Table 4:** Distribution and Association of Nurses' Knowledge with Their Years of Experience in Health Field

Nurses' Knowledge Years of experience in health field	No.	Pre-test Mean $\pm$ S.D.	Post 1 Mean $\pm$ S.D.	Post 2 Mean $\pm$ S.D.
1-5 years	52	0.41 $\pm$ 0.093	0.93 $\pm$ 0.075	0.97 $\pm$ 0.032
6-10 years	20	0.43 $\pm$ 0.098	0.94 $\pm$ 0.070	0.98 $\pm$ 0.021
11-15 years	9	0.40 $\pm$ 0.127	0.93 $\pm$ 0.056	0.96 $\pm$ 0.039
16-20 years	2	0.53 $\pm$ 0.054	0.97 $\pm$ 0.000	0.97 $\pm$ 0.000
21-25 years	2	0.35 $\pm$ 0.054	0.92 $\pm$ 0.073	0.95 $\pm$ 0.073
26-30 years	3	0.40 $\pm$ 0.015	0.93 $\pm$ 0.074	0.97 $\pm$ 0.000
31 years and more	2	0.36 $\pm$ 0.073	0.99 $\pm$ 0.018	0.99 $\pm$ 0.018
<b>Total</b>	90	0.41 $\pm$ 0.095	0.93 $\pm$ 0.069	0.97 $\pm$ 0.031
<b>ANOVA</b>		<b>F</b> = 0.866 <b>d.f.<sub>1</sub>/d.f.<sub>2</sub></b> = (6, 83) <b>P</b> = 0.523	<b>F</b> = 0.360 <b>d.f.<sub>1</sub>/d.f.<sub>2</sub></b> = (6, 83) <b>P</b> = 0.902	<b>F</b> = 0.904 <b>d.f.<sub>1</sub>/d.f.<sub>2</sub></b> = (6, 83) <b>P</b> = 0.496

This table shows that there is no statistical significant association between nurses' Years of experience in nursing field and their knowledge (pre test, post-1 and post-2)

educational program follow up (p value > 0.05), there are no differences between years of experience in health field mean of score of knowledge when analyzed by ANOVA.

**Table 5:** Distribution and Association of Nurses' Knowledge with Their Current Work Place

Nurses' Knowledge Current work place	No.	Pre-test Mean $\pm$ S.D.	Post 1 Mean $\pm$ S.D.	Post 2 Mean $\pm$ S.D.
Emergency	12	0.44 $\pm$ 0.105	0.95 $\pm$ 0.047	0.96 $\pm$ 0.026
Medical ward	30	0.40 $\pm$ 0.094	0.94 $\pm$ 0.065	0.97 $\pm$ 0.033
Surgical ward	21	0.39 $\pm$ 0.093	0.93 $\pm$ 0.086	0.97 $\pm$ 0.031
I.C.U	27	0.43 $\pm$ 0.092	0.94 $\pm$ 0.085	0.98 $\pm$ 0.030
<b>Total</b>	90	0.41 $\pm$ 0.095	0.93 $\pm$ 0.069	0.97 $\pm$ 0.031
<b>ANOVA</b>		<b>F</b> = 1.443 <b>d.f.<sub>1</sub>/d.f.<sub>2</sub></b> = (3, 86) <b>P</b> = 0.236	<b>F</b> = 0.212 <b>d.f.<sub>1</sub>/d.f.<sub>2</sub></b> = (3, 86) <b>P</b> = 0.888	<b>F</b> = 0.589 <b>d.f.<sub>1</sub>/d.f.<sub>2</sub></b> = (3, 86) <b>P</b> = 0.624

$\bar{x} \pm S.D.$  = Arithmetic Mean ( $\bar{x}$ ) and Std. Dev. (S.D.), No. = Number of frequencies, t = student (t-test), d.f. = degree of freedom, P = probability value.

This table shows that there is no statistical significant association between nurses' work place and their knowledge (pre test, post-1 and post-2) of an educational program follow up (p value > 0.05), there are no differences between work place mean of score of knowledge when analyzed by ANOVA.

the participants were female. Concerning the level of education, the majority of the nurses 52(57.8%) in the study and 47(52.2%) of the control group are both nursing Institute. There are many of technical institutes and the new employee pledge signature to stay 3 years in the teaching hospital prevent them to move to other hospital.

#### 4. Discussion

This table -1 reveals that the majority 39(43.3%) of nurses in the control group are within the age group (20 - 25) years while 38(42.2%) of nurses in the study group; the result was disagree with the study by (Shamsuddin A. & Shafie S., 2011) The mean age for the female respondents was 28.3  $\pm$  SD 2.4 years.

In relation to the current work place, 30(33.3%) of nurses in the study group and 27(30%) of nurses in the control groups of nurses were working in medical ward, It is agree with (Shamsuddin A. & Shafie S., 2011) were showed as 37% of them worked in medical ward, 22.3% of them worked in ICUs (Intensive Care Units & Coronary Care Unit), 15.9% of them worked in Orthopedic and 7.7% of them worked in psychiatric ward.

And the majority for both groups: the study group 52(57.8%) and control group 49(54.4%) have been female, It was agree with the study by (Asad Fathi & et al., 2014) a descriptive study of demographic data showed that 83.3% of

Regarding subject of number of years in the health field, the majority of both groups of nurses have (1-5 years) of experience 52(57.8%) of nurses in the study group and 47 (52.2%) of nurses in the control group; It is agree with study by (Shellie Bumgarner, 2008) were showed the years of

experience was grouped for analysis: 1-5 years (n=74), 6-10 years (n=31), 11-15 years (n=30), 16-20 years (n=16), 21-25 years (n=14), greater than 26 years (n=31).

Number of years in current work place, the majority of both groups are nurses have (1-5 years) of experience in current work place 52(57.8%) and 42 (46.7%) of nurses in the study and control groups respectively; The result disagree with the study by (Jolly Johnson, Merlin Thomas, 2012) that showed  $\leq 2$  year was 6.5% , 2-4 years was 22.9% , 4-6 year was 22.4% , 6-8 years was 12.6% ,  $\geq 8$  years was 35.3% Concerning number of years in military branch, the majority of both study and control groups of the nurses have not service in military branch 79(87.8%), 71(78.9%) respectively.

Concerning number of courses regarding drugs administration, 18(60%) of nurses in the study group were 62(68.9%) of nurses and 57(63.3%) in the control group have not had training courses it is agree with study by (Maurer Mary Jo , 2010) that showed (61.9%) participated in formal pharmacology courses while pursuing their undergraduate degrees. The majority of nurses (51%) reported having attended some type of continuing education in pharmacology within the past year. Approximately one-half of all responding nurses (49.9%), reported they had never had their mathematical skills tested since becoming a nurse or it was more than five years since having these skills tested.

Regarding to subject of the transition to another department didn't included drug administration , the majority of both study and control groups of the nurses disagree transition to another department 88(97.8%), 82(91.1%) respectively, and Finally the majority of the nurses have not an outpatient clinic after the official work in study group 66(73.3%) and 71(78.9%) in the control group; It is agree with study by (Mohammadi A, & et al., 2012) were showed (5.3%) were working in more than one hospital and 97.7 none of the nurses had a second job.

Statistically, there is no significant difference between study and control groups related to age group ,gender, level of educational, current work place, number of years in the health field, number of years in current work place, Number of years in military branch, number of courses regarding drugs administration , transition to another department , have a clinic after the official work, when analyzed by fisher exact Probability test and students (t-test). In tablet 2 reveal that there are highly significant differences between three period (pre, post-1 and post-2 tests ) at the study group in all domains of nurses' knowledge concerning medication errors; when they are analyzed by ANOVA. It is agree with study by (Naglaa Fathy & Refaat A. Kabeel ,2016 ) was showed the levels of nurses' knowledge about the dimensions of medication administration and error during different phases of program intervention. While in the mean of score tablet 3 it is agree with another study by ((Hsaio, *et al.*, 2010) After the intervention the post test1 significant improvement in the intervention group (pre vs. post; 77.2 $\pm$ 15.5 vs. 94.7 $\pm$ 7.6; paired t = 10.82, p<0.0001) but not in the control group (pre vs. post; 74.3 $\pm$ 14.7 vs. 75.5 $\pm$ 14.2; paired t = 0.60;

p=0.247). intervention appears to be effective in strengthening nurses' knowledge. Finally in tablet 4 and 5 agree with study by (Naglaa Fathy & Refaat A. Kabeel, 2016) were showed the mean score and correlation of the nurses' knowledge about total medication administration and Error during different phases of program intervention. The mean score before program (7.736 $\pm$ 1.826) was improved immediate after program (15.763 $\pm$ 1.496) and one month after program (16.157 $\pm$ 1.241). There was highly statistically significant improvement of nurses' knowledge of medication administration and Error during different phases of program intervention (p=0.000). And disagree with in the same study (Naglaa Fathy & Refaat A. Kabeel , 2016 ) the Correlation between nurses' knowledge about total medication administration and Error and their demographic characteristics during different phases of program intervention. There was a statistically significant between position of the nurse and their knowledge during different phases of program intervention. On the other hand, there was no significant

## 5. Conclusion

- 1) The study concluded that nurses working in the medical, surgical, emergency departments and intensive care unit have poor nursing knowledge related to medication errors
- 2) This study concluded that improving nursing staff knowledge about medication error after intervention.

## 6. Recommendations

- 1) The present study recommends continuous education program for all nursing staff in deferent level of education in all my country's hospitals to decrease medication errors to reduce patient risk of harm and promote the patient safety.
- 2) Conducting research to evaluation of nurses' practical skills in medication and other research to evaluation and deduction of medication errors for all medical and nursing staff that have direct contact with the patient.

## 7. Acknowledgment

I'd like to Special thanks and gratitude are offered to the faculty staff in my college of nursing and especial thank and gratitude to my supervisor, for their cooperation and support during conducting this study

## References

- [1] Alwani M. Hadi, guidelines for the Iraqi pharmacovigilance System 2012 ,iraqi pharmacovigilance center version.1,2.
- [2] Vijay Roy, Basak S C, Prasad G S, Patient From the Medication Counseling : An Essential of the pharmacy profession, we think Concept; Chronicle Pharma Biz, April 2004, that we will do the justice by providing such Vol.4 , No.20 ,8,22
- [3] Barker KN ,Flynn EA, Pepper GA, et al. Comparison of methods for detecting medication errors in 36

- hospitals and skilled nursing facilities. *Am J Health Syst Pharm* 2002;59:436–446.
- [4] Cook, D.J., Montori, V.M., McMullin, J.P., Finfer, S.R., Rocker, G.M. (2004). "Improving patients' safety locally: changing clinician behavior". *Lancet*, 363, 224-1230
- [5] Van Harten WH, Manen JV (2009) The Occurrence of Medication Errors and the Occurrence of Risk Factors for Medication Errors in State Hospitals in Ghana: Patient's Safety Improvement in Focus. *Healthcare Management* 1-74
- [6] Weant K., Bailey A., and Bake S. (2014): Strategies for reducing medication errors in the emergency department. *Open Access Emerg Med.* (6)1: 45–55. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4753984/>
- [7] Al-Youssif S., Mohamed L., Mohamed N. (2013): Nurses' Experiences toward Perception of Medication Administration Errors Reporting. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*.1(4):56-70. [www.iosrjournals.org](http://www.iosrjournals.org)
- [8] Blegen MA. Knowledge from quality improvement activities. *Nurs Research*. 2008;57(1) in press. [PubMed]
- [9] Hughes R., and Blegen M. (2008): Patient Safety and Quality: An Evidence-Based Handbook for Nurses. [https://www.ncbi.nlm.nih.gov/books/NBK2656/PP\\_1-27](https://www.ncbi.nlm.nih.gov/books/NBK2656/PP_1-27)
- [10] Abusaad Abusaad F., and Etawy E. (2015): Medication Administration Errors at Children's University Hospitals: Nurses Point of View. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*. 4 (1): 51–60. [www.iosrjournals.org](http://www.iosrjournals.org)
- [11] Johari H., Shamsuddin F., Idris N., and Hussin A. (2013): Medication errors among nurses in Government Hospital. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* 1,( 2): 18-23. [www.iosrjournals.org](http://www.iosrjournals.org).
- [12] Miglani P. (2015): Application of Lean Six Sigma in Reduction of Medication Errors. *Journal of Multidisciplinary Research in Healthcare*. 2 (1): 55-71. Access at [www.chitkara.edu.in/publications](http://www.chitkara.edu.in/publications)
- [13] Ching M., Long C., Williams L., and Blackmore C. (2013): Using lean to improve medication administration safety: in search of the "perfect dose". *J quality and patient safety* 39(5):195-204
- [14] Arnado J. (2014): Minimizing Avoidable Interruptions During Medication Administration Reducing Medication Errors by Addressing Interruptions and Working with Unit Clerks Master Thesis. University of San Francisco. School of Nursing and Health Professions. pp. 1-40.
- [15] Gurwitz Jh, field TS. Avorn J. et al. Incidence and preventability of adverse drug events in nursing homes. *Am J Med.* 2000;109:87-94
- [16] Ahmad Fuad Shamsuddin and Sarah Diyana Shafie Knowledge of nurses in the preparation and administration of intravenous medications Quality Use of Medicines Research Group, Faculty of Pharmacy, Universiti Kebangsaan Malaysia 2011 Published by Elsevier Ltd. Selection and/or peer reviewed under responsibility of the UKM Teaching Learning Congress 2011 Open access under CC BY-NC-ND license.
- [17] Asad Fathi & et al., Survey of medication error by nurses self-report in intensive care unit of Imam Khomeini hospital-Tehran International Research Journal of Applied and Basic Sciences, 2014 Available online at [www.irjabs.com](http://www.irjabs.com) ISSN 2251-838X / Vol, 8 (10): 1726-1732
- [18] Shellie M. Bumgarner, RN, BSN, The Impact of Formal Nursing Education and Nursing Experience on Medication Errors Made by Nurses in the Hospital 2008. A project submitted 2010, to the faculty of Gardner-Webb University School of Nursing, Boiling Springs p.p16 the "perfect dose". *J quality and patient safety* 39(5):195-204 Theses and Dissertations. Paper 911 View. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*. 4 (1): 51–60. [www.iosrjournals.org](http://www.iosrjournals.org)
- [19] Maurer Mary Jo, "Nurses' perceptions of and experiences with medication errors" (2010). The University of Toledo The University of Toledo Digital Repository.
- [20] Ahmad Fuad Shamsuddin and Sarah Diyana Shafie Knowledge of nurses in the preparation and administration of intravenous medications Quality Use of Medicines Research Group, Faculty of Pharmacy, Universiti Kebangsaan Malaysia 2011 Published by Elsevier Ltd. Selection and/or peer reviewed under responsibility of the UKM Teaching Learning Congress 2011 Open access under CC BY-NC-ND license.
- [21] Jolly Johnson, Merlin Thomas Medication errors: Knowledge and attitude of nurses in Ajman, UAE, 2012. Department of Nursing, Gulf Medical College Hospital and Research Centre, Ajman, UAE. GMJ, 4th Annual Scientific Meeting of Gulf Medical University Oral Proceedings [www.gulfmedicaljournal.com](http://www.gulfmedicaljournal.com)
- [22] Mohammadi A, Zarea K, Rasouli M, Haghhighizadeh MH. 04.12.2012, Medication errors and their relationship with job and demographic characteristics among nurses in hospitals of Ahvaz Jundishapur university of medical sciences. *Jentashapur J Health Res* 2014; 5(3):143.
- [23] Hsaio, et al., 2010. Nurses' knowledge of high-alert medications: Instrument development and validation. *Journal of Advanced Nursing*, 66(1), 177-199.) [https://www.ncbi.nlm.nih.gov/books/NBK2656/PP\\_1-27](https://www.ncbi.nlm.nih.gov/books/NBK2656/PP_1-27). Hughes R., and Blegen M. (2008): Patient Safety and Quality: An Evidence-Based Handbook for Nurses. *International Journal of Nursing Practice*; 17: 548-55.
- [24] Naglaa Fathy & Abeer Refaat Kabeel Effect of Educational Clinical Guidelines Program of Medication Errors on Pediatric Nurses' Knowledge Regarding Patient Safety, 2016 *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* e-ISSN: 2320–1959.p-ISSN: 2320–1940 Volume 5, Issue 6 Ver. VII (Nov. - Dec. 2016), PP 98-106 [www.iosrjournals.org](http://www.iosrjournals.org)