

## Effect of an Instruction Guidelines on Intern- Nurses' Performance Regarding Medication Errors & Management

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**Abstract:** Medication errors are considered one of the most common factors that harming patients. It has important effects on increased length of hospitalization, increased mortality and costs. Prevalence rates range widely from 0.2% to 90.6% reflecting differences in the type of medication errors (in the UK) this (incidence and prevalence of this nursing problem. **Aim of the study:** was to evaluate the effect of instruction guidelines on nurses' performance regarding medication errors & management and to assess the attitude of intern-nurses about medication and its causes. **Subjects and Methods:** A quasi-experimental design with one group pre, post, and follow-up was utilized to achieve the aim of the study. **Setting:** study was conducted in medical & surgical departments at Benha University Hospital where intern-nurses were trained. **Sample:** All the available intern-nurses (200) who were enrolled in the internship year (2017-2018). **Tools:** two tools were used for data collection, First tool: intern-nurses' structured Questionnaire: It consisted of two main parts; the first part: It includes Intern-nurses' demographic data. The second part: to assess intern-nurses' knowledge & attitude regarding medication errors, and its causes. Intern-Nurses' medication administration observational checklist. **Results:** more than half of study subjects were a Secondary school, ranged from 22-< 23 years, female and single, distributed in medical department, they did not have any previous training regarding medication administration. There was a high statistical significant improvement in total level of intern-nurses' attitude and performance after intervention both post and follow up program. Toward medication administration, there was a positive statistical significant correlation between intern-nurses' attitude regarding causes of medication errors and medication administration skills. **Conclusion:** There was a high statistical significant improvement in total level of intern-nurses' attitude and performance after intervention both post and follow up program and there was a positive statistical significant correlation between intern-nurses' attitude related to causes of medication errors and medication administration skills. **Recommendations:** The study recommends that instruction guidelines about medication administration & errors should be applied & evaluated periodically on different nursing areas.

**Keywords:** Instruction Guidelines, Intern-Nurses, Medication Management, Risk of Errors.

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### I. Introduction

Medication administration errors is considered one from many vital nursing errors which are very common, nurses have sensitive role in preventing such errors. Medication errors can occur at any point of the medication-use system [5]. Nurse is responsible not only about preparing and simply administrating medication but also she is responsible about medication management and safety [37].

Most of errors caused by under graduate students and internship nurses. Internship is an obligatory training year for all bachelor nursing students. Nursing curriculum should provide nursing students with an opportunity to strengthen nursing skills, and apply their knowledge in various clinical practices, demonstrate & develop competency in practical skills and procedures in which nursing efficiency describes skills, knowledge and other characteristics which necessary in nursing professional practice. It can be classified into behavioral and technical, both of them are based on knowledge and may require professional judgment and clinical decision making [26] Technical efficiencies contain administering and managing enteral and parenteral giving medication as well as calculating dosage, behavioral efficiency which contain the articulation of nursing scope of practice to others, many studies that explored many types of errors in medication as health care professionals, those occurring at prescription, dispensing, monitoring, and administration [12].

The study by (Volpe, 2017) identified thirty four activities undertaken by different professionals, which show error complexity and greater possibility [42]. During medication preparation and administration; the errors identified contain human resources, interruptions, deposition, environmental problems, and lack of patient identification, infrastructure, and technical hazards, in addition to compliance with protocols rules and security.

The key role of the nurses is the secure and efficient management of medication [6&36]. One of the major responsibilities of a nurse manager in any health care setting is managing of medication. As mentioned by [9] inappropriate or deficient knowledge about medication leads to medication errors, which are difficult to discover, the complexity of medication management include different phases including; prescribing, transcribing, ordering, dispensing, supplying, administering and storing [16 & 30]. Many studies reported that large percentage of newly graduated nurses during the first year of their experience changed their job and more turnovers. The morbidity due to medication errors affect quality of life and increase cost of health care [15 & 41].

Medication errors defined by National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP, 2016) as a preventable event that may cause or lead to inadequate medication use or patient hurt, while the medication is in the control of the healthcare professional, consumer or patient [32]. Many studies concerning factors in relation to medication errors deduced that there are many factors affecting medication administration and causing errors such as hindering during medication rounds, dosage calculation mistakes, knowledge deficit about medication administration and management, bad communication, inability to follow pertinent protocols with rule violations and inappropriate performance and staffing or inadequate resources (Hearkeanen et al. 2016), job tension, carrying complicated tasks, as incompetence staff and lack of professional development, inadequate system of error information exchange, increased number of high-risked patients & complex technologies [3, 13, 17, 29, 37].

A clinical supervision program should be periodically conducted for all first line managers. The supervisor should evaluate first line managers' knowledge continuously and motivate them to apply effective clinical supervision. First line managers should develop a supportive working conditions and relationship that encourage trust, empathy and mutual regard for staff nurses. First line managers should allow supervisors to know their limitations; provide them with the opportunities for challenge and promotion or advancement to reducing the risk of errors [14]

### **I.1. Significance of the study:-**

Researchers observe a lot of studies reported medication errors rates, and there is highly cost of medication errors in specific settings and there is little evidence about how medication errors lead to patient harm. So that, researches concise focus on improving routine collection of information about errors and patient harm, and supporting implementation of evidence-based instructions to reduce errors. The institutions should implement strategies to reduce these types of errors to prevent patients' harm. In areas that high-risk populations, processes, high-alert medications, and easily confused drug names.

### **I.2. Aim of the study:-**

This study aimed to evaluate the effect of instruction guidelines on nurses' performance regarding medication errors & management through:-

1. Assessing intern-nurses' actual performance toward medication administration errors & management throughout instruction guidelines phases.
2. Implementing instruction guidelines about causes of medication errors and medication management.
3. Assessing the attitude of intern-nurses about medication and its causes.
4. Evaluating the effect of the instruction guidelines about medication management on intern-nurses' performances toward medication errors.

### **I.3. Research hypothesis:-**

- 1- The intern-nurses who receive instruction guidelines will be having a positive influence on their attitude toward causes of medication errors.
- 2- The intern-nurses who receive instruction guidelines about medication management will be improved in their performance after implementing the instruction guidelines.

## **II. Material And Methods**

**II.1 Research design:** A Quasi experimental design was used to achieve the aim of the present research.

**II.2 Setting:** - The current study was conducted in departments at Benha University Hospital where intern-nurses were trained. These departments were as follow; medical department which is consisted of (Intensive

Care Unit "ICU", Coronary Care Unit "CCU", dialysis unit and premature unit) and surgical department which is consisted of (operating rooms, obstetric "labor & caesarian section" and emergency).

**II.3 Subjects and sample:** All the available intern-nurse (200) who were enrolled in the internship year (2017-2018) at the faculty of nursing included in the study. The enrolled intern-nurses divided into 6 groups according to their clinical setting schedule each group composed of (33-34) intern-nurse.

**II.4 Tools of data collection:**

Data for the present research was collected by using the following two tools.

**First tool:** Intern-nurses' Structured Questionnaire: it was Adapted from ( SVITLICA B.B et al., 2017) [40], and modified by the researchers according to their clinical experience, referring to system and individual causes of medication errors & It consisted of two main parts; the first part: includes intern-nurses' personal data like (department/unit, age, gender, marital status, grade score, and previous training about medication management).The second part: includes different items to assess intern-nurses' knowledge and attitude regarding medication errors. It consisted of (32) items categorized under 6 main categories; medication packaging and pharmacy (3 items), physicians' factors (6 items), communication factors (6 items), nurses' factors (10 items), patients' factors (1 item), system failures (6 items). The content validity of the questionnaire was confirmed by five experts in medical surgical nursing and administration nursing.

**The scoring system:**

The items were judged according to three point Likert Scale continuum from: disagree (1 point), neutral (2 point), and agree (3 point). Each intern-nurse choose only one best answer after reading and understanding carefully, finally, the answer was graded according to the following mean scores that reflect the overall attitude of each intern-nurse:

- ⇒ Low            → 60% score (0- < 57)
- ⇒ Moderate      → 60% - < 75% score (58- < 71)
- ⇒ High            → 75% score (72- 96)

**Second Tool:** Intern-Nurses' medication administration observational checklist: it was an observational checklist developed by the researchers through review of related literatures. Observation is the most powerful method to accurately detect medication administration error. This tool prepared by CRCCG Medicines Management Care Homes Team (2014) and adapted by the researchers and consists of criteria of observation which include; preparation prior to administration, administering the medication. This tool aims to assessing performance skills of intern-nurse through instruction guidelines, related to medication administration. The observation check list was consisted of (42) items. These items were grouped under the following six main categories as follows; 1- preparation prior to administration (19 items) distributed as; A- prepare (7 items), B- check medication administration request "MAR" chart (9 items), C- prepare medicine posts/spoons or other equipment (3 items), 2- administering the medication (5 items), 3- signing the MAR chart (3 items), 4- if any medication is not administered (6 items), 5- giving PRN medication (5 items), and 6- housekeeping (4 items) The scoring system:

The scoring system of the observational checklist was based on a three point Likert Scale as follows: "done completely" (2 point), "done incompletely" (1 point), and "not done" (0 point). The total scores (84) and cut point was done at 60% = 50.4 scores, the rang scores of observational checklist were expressed as follow:

- ⇒ Poor            → < 60% score (0- < 50)
- ⇒ Average        → 60% - < 75% score (51- < 62)
- ⇒ Good            → ≥ 75% score (≥ 63- 84)

**II.5 Operational design:**

The current research was carried out on three phases; preparation, implementation, and evaluation.

**A-Preparation Phase**

In this phase the researchers reviewed the current available national and international literature review and exploring internet to develop the study tools for data collection and designing the educational program. Finally the tools were revised and modified.

**-Content validity of the tools:-**

The content validity was done through five panels of expertise in nursing administration & medical surgical nursing specialty for face and content validity, and their opinions were requested via an assessment form. The experts were asked to grade each item as "essential," "useful but inadequate" or "unnecessary". There were no any modifications that were carried out according to the panel's judgment on the clarity of sentences and appropriateness of content.

**- The reliability of the tools**

Reliability was applied by the researcher for testing the internal consistency of the tool by administration of the same tools to the same subjects under similar conditions on one or more occasions. Answers from repeated testing were compared (Test-re-test reliability). The reliability value for attitude toward causes of medication errors by using Cronbach's Coefficient Alpha was (0.885). The reliability value for medication administration observational checklist was (0.896).

**- Pilot study**

A pilot study was conducted on 20 intern-nurses only from the total number of subject: (200) intern-nurses. It was done to assess the tools feasibility, clarity, objectivity, and time required to fill the tools that approximately ranged from (25-60) minutes. The intern nurses who included in the pilot study were not excluded from the main study sample.

**B-Implementation Phase (Procedure):**

- The preparation and construction of the data collections tools and contents of Instruction Guidelines consumed around three months from September to November 2017. The researchers started to assess the readiness of the subjects in the study settings to announce and encourage subjects' participation in the study.

- After that explaining the aim of study to intern-nurses and their clinical instructors, and head nurses and their assistants to gain their cooperation and agreed to attend the educational program. They also, agreed to provide the researchers with the leaning room in their units for meet the intern nurse .

- During the period from December 2017 to January 2018 the researchers start to conducted the pilot study on 10% of total sample (20 intern-nurses), which they were included in the main study subjects. Then, the researchers distribute the questionnaire for the total number of intern-nurses preprogram to assess base line data. To detect the intern nurses needs after that. Instruction Guidelines were distributed for intern-nurses in different departments at Benha University Hospital.

- The instructional designs were designed to provide intern-nurses with an opportunity to develop their performance about medication management regarding medication errors. Different instructional strategies, methods of teaching, media and methods of evaluation were selected to suit the learners' needs, and achieve the objectives and contents of the program. It covering the following items; introduction and overview about medication management, causes of medication errors, complications, side effect of medication errors, guidelines to prevent and overcome medication errors, consideration and instructions for effective medication administration, and nursing ethics of medication administration.

- The teaching sessions consumed (14) hours distributed as the follows: (7) sessions (2 hours for each session), achieved by using available resources, relevant contents, and instructional strategies for each session. Different teaching methods were used such as lectures, group discussion, and brain storming.

- Instructional media included, handout prepared by researchers and distributed to participants in the first day of the program. Instruction Guidelines of the medication management were Conducted along three months from February till April 2018.

- The subjects were divided into (6) groups according to their clinical training area the (4) groups were included 33 intern-nurses and the final (2) groups were included 34 intern-nurses. Each group divided into (2) subgroups (16-17 intern nurses). The course content of the program took about seven days; one day for orientation and the other six days for the course content of the program. The duration of each session was two hours depending on workload and including periods of discussion according to their achievement, progress, and feedback. It started at 12-2 P.M.

- An orientation to the training sessions and its aims took place at the beginning of each session. Feedback was given at the beginning of each session about the previous one and at the end of each session about the current session and the program situations given to the intern-nurses to write their suggestions for alternative solutions.

**C-Evaluation Phase (Procedure):**

During the period of May to June 2018, the effect of the instruction guidelines was evaluated, using the same tools that used before the program. In addition to the period of July to August 2018, the follow-up of the instruction guidelines was evaluated, using the same tools that used in before and post the program. The data were analyzed and interpreted, and clinically evaluated for comprehensive discussion of the data analysis results of the study.

**II.6 Ethical considerations:**

The oral consent was obtained from intern-nurses to participate in the study. During the initial interview the purpose of the study was explained. The intern-nurses reassured that their participation was voluntary and they had the right to withdraw from the study at any time if they want and without any costs. All information would be confidential.

## **II.7 Administrative Design**

An official approval was obtained from the Dean of Faculty of Nursing and directors of Benha University Hospital to allow the researchers to use the learning classrooms at the hospital.

## **II.8 Statistical analysis:**

Data were verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 20.0) was used for that purpose, followed by data analysis and tabulation. Descriptive statistics were applied (e.g., frequency, percentages, mean, and standard deviation). Test of significance (Chi-square and ANOVA test) were used to compare among mean scores of intern-nurses through study phases. To test the study hypothesis Pearson correlation coefficients were used. A statistically significant level was considered when  $p\text{-value} \leq 0.05$ , and a highly statistically significant level was considered when  $p\text{-value} \leq 0.01$ .

## **III. Result**

Table (1): showed that more than half of intern-nurses (56%) had a Secondary school, in relation to age less than half (46.4%) their age were ranged from 22–< 23 years, while (10%) their age were  $\geq 25$  years, about two thirty (71% & 74%) of them were female and single respectively. As far as their Grade Score about half of them (51%) had a very good score while less than quarter (15%) has a good score. As regarding to department more than half (64.5%) of them, were distributed in medical department, and about two thirty (70.5%) of them reported that they haven't any previous training regarding medication administration. Figure (1): showed that there was high statistically significant improvement in total level of intern-nurses' attitude after intervention both post and follow up of the instruction guidelines, the majority (73%) of intern-nurses were reported negative attitude toward causes of medication errors before intervention. While most of them (90.5%) were reported highly positive attitude that represent in immediate post instruction guidelines and more than half (62.5%) of them was reported positive attitude in the follow-up phase of the instruction guidelines. Table (2): Finding of the table revealed that there were highly statistical significant improvement in intern-nurses' attitude related to causes of medication errors after intervention both post and follow up instruction guidelines, the total mean scores of intern-nurses' attitude was low ( $51.84 \pm 7.986$ ) at pre-program and it improved to ( $79.27 \pm 6.491$  and  $67.6 \pm 9.162$ ) at post and follow up instruction guidelines respectively. As showed in Table (3): there was highly statistically significant difference in intern-nurses' attitude toward causes of medication errors ( $p < 0.001^{**}$ ) between pre, post, and follow-up phase of the instruction guidelines. Minority (7.5% & 9%) of intern-nurses reported strongly agree related to different medicines are like and similar drug packing and it was increased to (62% & 63%) respectively in immediate post of the instruction guidelines while it was decreased to (39.5% & 38.5%) respectively in the follow-up of the instruction guidelines but still more than pre- program. Figure (2): illustrated that, there was a highly significant improvement in the performance' level of the studied intern-nurses about medication administration skills throughout post and follow-up after three months of the instruction guidelines. Their performance was poor in most of them (98.5%) at pre instruction guidelines and it was improved and become good among more than half of them (59.5% & 53.5%) at post follow-up instructions guidelines respectively.

Table (4): Finding of the table displayed that there were statistical significant improvement in performance of intern-nurses toward medication administration skills after intervention both post and follow up instruction guidelines, the total mean scores of intern-nurses' performance was low ( $30.28 \pm 8.573$ ) before intervention in the pre- instruction guidelines and it was increased ( $62.88 \pm 12.459$ ) that represent in the immediate post program and it slightly decreased ( $48.98 \pm 8.917$ ) in the follow up after three months but still more than pre instruction guidelines. Table (5): illustrated that there was high statistically significant improvement in the performance of the intern-nurses toward medication administration skills after intervention both immediately post and follow-up the instruction guidelines. More than half (58.5%) of the observed intern-nurses; their skills was reported as not done related to checks of MAR (Medication administration report) for needed information (special instructions) and notes allergies in pre- Instruction Guidelines and it was decreased to (12%) that represent in the immediate post Instruction Guidelines while it was increased to (19%) in the follow up after three months of the program but still less than pre- Instruction Guidelines. Table (6): The finding of this table indicated that there was a positive statistical significant correlation between intern-nurses' attitude toward causes of medication errors and medication administration skills. This means when intern-nurses' attitude toward causes of medication errors is increased, their skills toward medication administration is improved.

IV. Figures And Tables

Table (1): Distribution of intern-nurses' personnel characteristics (N= 200).

Personnel characteristics	No	%
<b>Department</b>		
Medical	129	64.5%
Surgical	71	35.5%
<b>Age</b>		
22 – < 23 years	102	46.4%
23 – < 24 years	48	21.8%
24 – < 25 years	48	21.8%
≥ 25 years	22	10%
Mean ± SD	22.95 ± 1.041	
<b>Gender</b>		
Male	58	29%
Female	142	71%
<b>Marital status</b>		
Single	148	74%
Married	52	26%
<b>Educational Qualification</b>		
Technical school diploma	23	11.5%
Secondary school	112	56%
Associated Nursing Institute	65	32.5%
<b>Grade Score</b>		
Excellent	68	34%
Very Good	102	51%
Good	30	15%
<b>Previous training</b>		
Yes	59	29.5%
No	183	70.5%

Figure (1): Total level of intern-nurses' attitude toward causes of medication errors through study phases. (N=200)

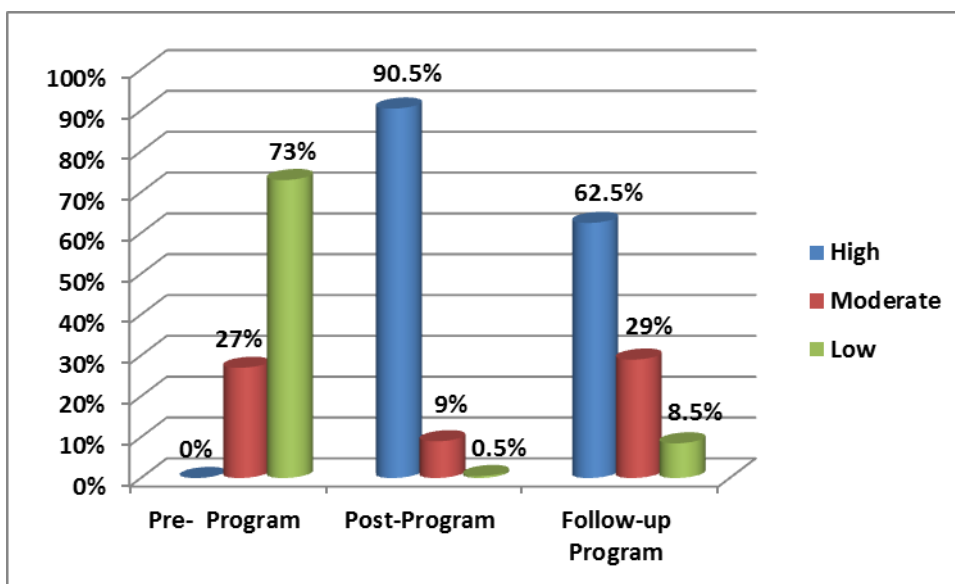


Table (2): Mean scores of intern-nurses' attitude and knowledge toward causes of medication errors. Pre, post and follow-up (N= 200).

Causes of medication errors	5. Max Score	Pre- Instruction Guidelines		Post- Instruction Guidelines		Follow-up Instruction Guidelines		F Test	P Value
		$\bar{X}$	±SD	$\bar{X}$	±SD	$\bar{X}$	±SD		
1. Medication packaging and pharmacy	9	4.070	±1.2093	7.475	±1.145	6.305	±1.514	306.151	0.0001

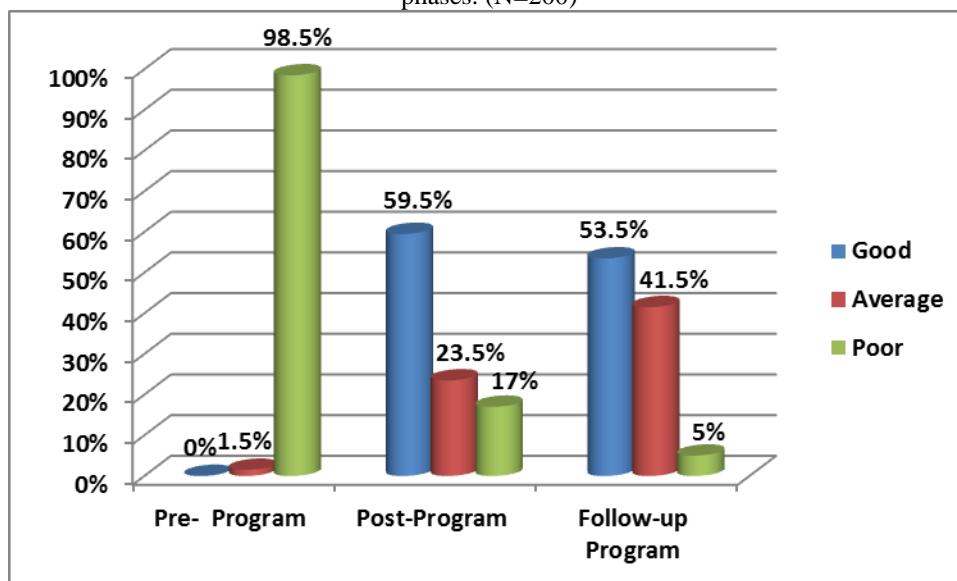
2. Physician factors	18	10.050	±2.411	15.005	±2.075	12.730	±2.567	220.844	0.0001
3. Communication factor	18	10.205	±2.574	14.700	±2.102	12.870	±2.809	161.853	0.0001
4. Nurses factor	30	16.395	±3.737	24.985	±3.522	21.020	±3.482	288.008	0.0001
5. Patient factor	3	1.435	±0.705	2.495	±0.701	2.080	±0.828	102.033	0.0001
6. System failures	18	9.690	±2.206	14.610	±2.287	12.600	±2.637	215.245	0.0001
Total	96	51.84	±7.986	79.27	±6.491	67.6	±9.162	598.653	0.0001

Table (3): Frequency distribution of intern-nurses' attitude and knowledge toward causes of medication errors through the study phases. (N=200)

Causes of medication errors	Pre- Instruction Guidelines N= 200			Post- Instruction Guidelines N= 200			Follow-up Instruction Guidelines N= 200			X <sup>2</sup>	P value
	Strongly agree	Agree	Disagree	Strongly agree	Agree	Disagree	Strongly agree	Agree	Disagree		
<b>I- Medication packaging;</b>											
1. Drug name confusion	20	36	144	120	49	31	74	73	31	1.781	0.0001
2. Different medicines are like	15	43	15	124	54	22	79	63	58	1.888	0.0001
3. Similar drug packing	18	29	153	126	52	22	77	65	58	2.110	0.0001
<b>II- Communication with physician</b>											
4. Sometimes physician orders are illegible	41	62	97	111	68	21	78	76	46	88.318	0.0001
5. Complex orders	38	52	110	118	68	14	76	64	60	1.188	0.0001
6. Poor hand writing	43	42	115	125	63	12	83	66	51	1.373	0.0001
7. Un clear and precise physician orders	40	52	108	109	70	21	77	68	55	97.413	0.0001
8. Abbreviations are often used instead of writing full names of medicines	50	44	106	117	58	25	79	69	52	88.816	0.0001
9. Sometimes using of oral orders instead of the written ones	46	42	112	126	62	12	67	65	12	1.271	0.0001
<b>III- Communication</b>											
10. Poor communication between physician and nurses	31	69	100	116	59	25	84	62	54	96.646	0.0001
11. Poor communication among nurses	45	64	91	112	61	27	82	62	56	63.765	0.0001
12. Inadequate information about new medicines to staff	37	69	94	112	59	29	82	76	51	75.564	0.0001
13. Inappropriate pharmacologic knowledge	35	56	109	112	60	28	84	71	45	1.015	0.0001
14. Invasion of the useful medication procedures	50	55	95	120	55	25	79	71	50	77.048	0.0001
15. Recurrent interruptions during medicine preparation and giving it to a patient	41	50	109	126	50	24	74	71	55	1.099	0.0001
<b>16. Nurses</b>											
17. A lot of patients get the same or similar medicines	54	52	94	18	37	145	64	61	75	1.055	0.0001
18. The number of nurses in a ward is inadequate	39	58	103	129	41	30	65	71	64	1.039	0.0001
19. A lot of patients are supposed to be given the therapy at the same time, which is not real in practice	30	53	117	130	48	22	81	64	55	1.366	0.0001
20. Equipment does not work properly or is not set properly (e.g. Infusion pumps)	44	44	112	134	42	24	80	71	49	1.244	0.0001

Causes of medication errors	Pre- Instruction Guidelines N= 200			Post- Instruction Guidelines N= 200			Follow-up Instruction Guidelines N= 200			X <sup>2</sup>	P value
	Strongly agree	Agree	Disagree	Strongly agree	Agree	Disagree	Strongly agree	Agree	Disagree		
21. Most of the errors happen because of the negligence of the basic rule '5p'	37	45	118	130	38	32	83	61	56	1.150	0.0001
22. High-risk medicine preparation without rechecking	36	58	106	143	28	29	85	61	54	1.278	0.0001
23. New staff, unfamiliarity with medication and unfamiliarity with patient	27	46	127	115	51	34	70	71	59	1.242	0.0001
24. Not knowing conversion units	35	60	105	114	55	31	82	67	51	89.227	0.0001
25. Not remembering formulas	32	58	110	107	67	26	76	66	58	95.989	0.0001
26. Calculating incorrectly	41	55	104	121	54	25	76	65	59	91.939	0.0001
<b>IV- Patient factors</b>											
27. Complicated conditions	25	37	138	123	53	24	77	62	24	1.614	0.0001
<b>V- System failures</b>											
28. Being understaffed	30	59	111	131	42	27	75	54	71	1.187	0.0001
29. Heavy workload	25	66	109	123	44	33	79	68	53	1.174	0.0001
30. Insufficient training	25	52	123	105	51	44	74	69	57	99.485	0.0001
31. Vague authorization	30	54	116	110	53	37	100	51	49	1.014	0.0001
32. Inadequate system of error information exchange	67	44	89	119	48	33	75	60	65	46.086	0.0001
33. More and more complex technologies	30	49	121	127	54	19	74	64	62	1.413	0.0001
<b>Total</b>	<b>0</b>	<b>54</b>	<b>146</b>	<b>181</b>	<b>18</b>	<b>1</b>	<b>58</b>	<b>125</b>	<b>17</b>	<b>5.360</b>	<b>0.0001</b>

Figure (2): Total level of intern-nurses' performance toward medication administration skills through study phases. (N=200)





**Table (4):** Mean scores of intern-nurses' performance toward medication administration skills. Pre, post and follow-up (N= 200).

Medication Administration Skills	Max Score	Pre- Instruction Guidelines		Post- Instruction Guidelines		Follow-up Instruction Guidelines		F test	P Value
		— X	±SD	— X	±SD	— X	±SD		
1. preparation prior to administration	38	13.355	±4.541	28.470	±6.225	22.855	±5.337	398.584	0.0001
A. prepare	14	4.580	±2.509	10.215	±2.951	8.450	±3.295	192.682	0.0001
B. check medication administration Request "MAR" chart	18	6.42	±2.659	13.96	±3.691	10.90	±3.277	274.449	0.0001
C. prepare medicine posts/spoons or other equipment	6	2.350	±1.561	4.290	±1.593	3.510	±1.635	74.725	0.0001
2. Administering the medication	10	3.64	±2.190	7.16	±2.255	5.58	±2.409	119.268	0.0001
3. Signing the MAR chart	6	2.165	±1.930	4.540	±1.539	3.455	±1.526	100.661	0.0001
4. 4- if any medication is not administered	12	4.235	±3.062	8.935	±2.840	6.855	±2.452	141.851	0.0001
5. Giving PRN medication	10	3.54	±2.380	7.56	±2.411	5.72	±1.878	162.310	0.0001
6. Housekeeping	8	3.34	±1.834	6.20	±1.638	4.52	±1.641	141.418	0.0001
<b>Total</b>	<b>84</b>	<b>30.28</b>	<b>±8.573</b>	<b>62.88</b>	<b>±12.459</b>	<b>48.98</b>	<b>±8.917</b>	<b>520.765</b>	<b>0.0001</b>

**Table (5):** Distribution of intern-nurses' performance toward medication administration skills through the study phases. (N=200)

Medication administration skills	Pre- Instruction Guidelines N= 200			Post- Instruction Guidelines N= 200			Follow-up Instruction Guidelines N= 200			X <sup>2</sup>	P value
	Done Completely	Done incompletely	Not done	Done Completely	Done incompletely	Not done	Done Completely	Done incompletely	Not done		
<b>I- Preparation prior to Administration</b>											
<b>(A) Prepare</b>											
1. Safe environment	40	50	110	121	54	25	85	71	44	1.111	0.0001
2. Gathered all necessary supplies (e.g. cup, water, etc)	38	57	105	126	58	16	90	68	42	1.245	0.0001
3. Inform of individuals	39	49	112	103	70	27	81	67	52	92.557	0.0001
4. prepares medication area (clean)	35	49	116	95	74	31	85	71	44	1.005	0.0001
5. Checks MAR for needed information (special instructions) and notes allergies	38	45	117	124	52	24	99	63	38	1.324	0.0001
6. Washes hands	41	61	98	107	74	19	82	69	49	87.712	0.0001
7. Wears gloves	44	55	101	132	45	23	87	63	50	1.013	0.0001
<b>(B) Check MAR chart</b>											
1. Right name	42	63	95	134	42	24	96	53	5	96.666	0.0001
2. Right Medication	37	60	103	139	37	24	85	76	39	1.368	0.0001
3. Consent to treatment	40	54	106	126	55	19	78	83	39	1.301	0.0001
4. Signatures, legible, written correctly	43	56	101	144	39	17	87	73	40	1.380	0.0001
5. Right Route	40	63	97	140	46	14	87	71	42	1.316	0.0001
6. Right Dose	46	67	87	135	42	23	91	62	47	89.773	0.0001
7. Right Time	46	63	91	133	45	22	88	64	48	91.782	0.0001
8. Route of administration	37	58	105	109	56	35	87	61	52	76.929	0.0001
9. Special instructions	38	63	99	129	53	18	85	68	47	1.128	0.0001
<b>(C) Prepare medicine post/spoons or other equipment</b>											
1. Counts the correct dosage of medication and poured into cup without touching the medication	44	68	87	121	49	30	82	66	52	70.919	0.0001
2. Removes the correct amount of med from each container (pops bubbles in correct order)	44	62	93	113	58	29	87	69	44	73.339	0.0001
3. Clean and used equipment is clearly segregated	46	63	91	118	47	35	81	67	52	63.330	0.0001
<b>II- Administering the medication</b>											
1. Select designated area one individual at a time	43	59	98	110	60	30	69	68	63	67.943	0.0001
2. Greet the individual by name and offer medication	38	64	98	129	50	21	78	69	53	1.063	0.0001
3. Select the individual's MAR Chart and medicines Check that the chart and medication corresponds with the individuals name	42	64	94	107	60	33	93	57	50	63.019	0.0001

4. Check the dose on the MAR chart matches the dose on the pharmacy label -Is medication being offered at appropriate times? (e.g. Alendronic acid 30mins before breakfast, aspirin with or after food)	47	62	91	121	54	25	74	64	62	72.590	0.0001
5. Offer the individual their	40	59	101	102	71	27	82	66	52	75.167	0.0001
Medication administration skills	Pre- Instruction Guidelines N= 200			Post- Instruction Guidelines N= 200			Follow-up Instruction Guidelines N= 200			X <sup>2</sup>	P value
	Done Completely	Done incompletely	Not done	Done Completely	Done incompletely	Not done	Done Completely	Done incompletely	Not done		
medication, checking consent offering them a water to the individual (unless otherwise prescribed)											
<b>III- Signing the MAR chart</b>											
1. Sign the MAR sheet for each medication administered when you	43	54	103	124	47	29	79	64	57	87.143	0.0001
2. Believe that it has been swallowed	41	56	103	125	50	25	89	58	53	94.179	0.0001
3. Sign for any external applications	46	63	91	136	41	23	86	61	53	92.629	0.0001
<b>IV- If any medication is not administered</b>											
1. For any reason complete the MAR chart using the correct code as stated on the bottom of the chart	42	56	102	125	44	31	85	63	52	87.569	0.0001
2. Fully document the reasons for this	37	55	108	127	49	24	83	62	55	1.086	0.0001
3. Inform the staff member in charge of the shift	42	60	98	129	42	29	79	67	54	92.110	0.0001
4. Inform next staff on handover	42	64	94	121	47	32	79	68	53	76.233	0.0001
5. Observe the individual for any ill effects for refusal of medication and fully document	48	53	99	127	42	31	83	61	56	78.103	0.0001
6. Follow procedure for spoilt/refused medication	41	55	104	125	55	20	85	62	53	1.035	0.0001
<b>V- Giving PRN medication</b>											
1. Do not administer without appropriate guidance	45	60	95	128	40	32	73	69	58	83.818	0.0001
2. The use of PRN medication should be clearly outlined in the individual's support plan	48	63	89	138	35	27	79	71	50	95.521	0.0001
3. Follow guidance/protocols set up in the support plan	36	55	109	127	43	30	78	66	56	1.064	0.0001
4. Fully document that PRN medication has been given and record quantity given	40	59	101	130	44	26	93	58	49	99.635	0.0001
5. Sign the MAR chart and the PRN Chart, counting stock level and recording appropriately	39	55	106	136	33	31	83	69	48	1.176	0.0001
<b>VI- House keeping</b>											
1. Tidy medicine cupboard and ensure area is clean	44	58	98	132	45	23	73	69	58	1.007	0.0001
2. Check that medicine cupboard is locked, stocked and secured	36	59	105	140	42	18	77	65	58	1.331	0.0001
3. Wash and dry and equipment used	45	58	97	130	43	27	74	78	48	1.003	0.0001
4. Check all MAR Charts are complete, correct & that you have signed appropriately	96	52	52	132	42	26	90	63	47	23.088	0.0001
<b>Total</b>	<b>0</b>	<b>3</b>	<b>197</b>	<b>119</b>	<b>47</b>	<b>34</b>	<b>107</b>	<b>83</b>	<b>10</b>	<b>3.934</b>	<b>0.0001</b>

**Table (6)** Correlation coefficient between intern-nurses medication administration skills and their attitude toward medication errors

Attitude toward causes of medication errors	Medication administration skills	
	r	P-Value
Pre- Instruction Guidelines	0.058	<b>0.03</b>
Post- Instruction Guidelines	0.012	<b>0.867</b>
Follow-up Instruction Guidelines	<b>0.120</b>	<b>0.091</b>

## V. Discussion

According to intern-nurses' personnel characteristics .Present study shows that more than half of intern-nurses have a Secondary school, less than half of subject their age were ranged from 22-< 23 years, while (10%) their age were  $\geq 25$  years, about two thirty of them were female and single respectively. Also, about half of them had a very good score while less than quarter has a good score.

As regarding to department more than half of them, were distributed in medical departments, and about two thirty of them reported that they hadn't any previous training regarding medication administration. This result agree with (Sulosaari & Helena 2016) in the study about medication efficiency of nursing students which the results of his study showed that 89% of the nursing students were female and 11% male [39].

But this result disagree in (mean age 25 years). Most of the students had completed upper secondary school (65%) and a short syllabus in mathematics (41%) twenty two Percent of the students had a previous degree in nursing. The 2nd and 7th semester students' educational background was very similar. On average, the 2nd semester students had one and the 7th semester students seven clinical practice periods. Both groups of students had on average 12.5 months working experience in health care before entering the undergraduate nursing programme. Also, the study on baccalaureate nursing students' perceptions of medication discrepancies in clinical practice add that with a mean age of 26.3 (range 21-34 years). The sample consisted of mix of females (n = 5, 62.5%) and males (n = 3, 37.5%). Five students (n = 5, 62.5%) reported healthcare experience, and three students (37.5%) were not employed. Four students (n = 4, 50%) had associate degrees [35].

As related to level of intern-nurses attitude toward causes of medication errors. Pre, post, and follow-up program. This study showed that there was high statistical significant improvement in total level of intern-nurses' attitude after intervention both post and follow up program. The majority of intern-nurses were reported negative attitude toward causes of medication errors before intervention. While most of them were reported highly positive attitude in immediate post program and more than half of them was reported positive attitude in the follow-up phase of the program. This may the Nurses, need adequate medication training to be able to provide safe medication care without errors. This in agreement with (Hung et al. 2015) reported that Nurses' attitudes influenced intention to report medication administration errors; however, no connection was found between intention and actual reporting behavior. and suggest that institutions should increase nurses' awareness and recognition of medication error occurrence[22]. Also (Sulosaari & Helena 2016) concluded that the association with students' medication performance efficiency and between students' individual factors is strongest [39]. And should be Develop methods to improve nursing students' motivation self-confidence, and increase abilities to self -regulation to prevent error , although the results are better than in several international studies showed that the students perceived themselves to be well-motivated and active participation inpatient medication education[34] . To increase self-confident in medication management at the end of their education [9]. However, the present finding is similar to findings of recent studies by [20 & 36]. Positive attitude in medication management increased during the studies, and upon graduation the students were quite confident to assume their professional role in the multidisciplinary team responsible for patients' medication care.

Regarding to distribution of intern-nurses' attitude toward causes of medication errors through the study phases. (N=200) study portrayed that there was highly statistically significant difference in intern-nurses' attitude toward causes of medication errors ( $p < 0.001^{**}$ ) between pre, post, and follow-up phase of the program. Minority of intern-nurses reported strongly agree related to different medicines are like and similar drug packing and it was increased to more than half in immediate post program while it was decreased in the follow-up of the program but still more than pre -program. This may be due to wrong believe of student that the medication package not from significant nurses role other with the many study confirm that the essential role of nurses in the rational and judicious, use of medicines as well as in minimizing the adverse events that can potentially occur [10, 20 & 24] .Many studies reported that nursing errors during administration medication are the most common type, patient and medication safety without error is a global concern for health care and education [1,25,28 & 43 ] . Nursing play important role to prevent errors, this has been highlighted as the final more safety against medication errors [7, 21 & 38].

Regarding Total level of intern-nurses' performance toward medication administration skills through the study phases. Present Study illustrates that, there was a highly significant improvement in the performance' level of studied intern-nurses about medication administration skills throughout post and follow-up after three months of the program. Their performance was poor in most of them at preprogram and it was improved and become good among more than half of them at post follow-up program respectively. this may be in researcher view due to decrease learning and teaching hour of pharmacology in nursing students program and student not interest by medication and interest by basic nursing duties during training This agree with (Aggar & Dawson 2014) who stated that a review of nursing curricula and a reorganization of the educational framework could improve the nursing students efficiency in medication administration , and increase self- confidence in drug management [2]. The study reported that a positive change was shown in skills of nursing students when

the training and learning was changed. Placements is also necessary for the development of a national framework to ensure provision of a relevant and contemporary content of medication education during nurses' basic education [4] .

In a study by H€ark€anen et al. (2016), a performance deficit was found to be a common human factor in medication errors [18]. The study about nurses' experiences and perspectives on medication safety practices, found that nurses experienced a high degree of responsibility for medication administration activities, but they also feel that they played a role in the constant assessment of a patient's condition in relation to the medication prescribed, although it was mainly nurses who appreciated this expected role and most nurses indicated that extreme levels of work pressure or multitasking hampers their ability to work safely and cause a lack of concentration and rushed work [37]. This result has been suggested by Metti€ainen et al. (2014) recommended possibilities supporting practice, regular follow-up and evaluation of medication management is necessary to improve nursing students' medication efficiency prior to graduation to profession, . Regular update-education and verification of medication efficiency of nurses [31]. Therefore, in addition to the use of the Medication Passport as a tool, a national examination at the end of education could be an effective method for ensuring the medication efficiency of graduating nursing students. also (H€ark€anen et al. 2016),found connections between medication errors and knowledge deficits also Reporters' views on preventing medication administration errors were divided into three main categories related to individuals (health professionals), teams and organizations[18, 19 & 38].

Regarding to intern-nurses' performance toward medication administration skills through the study phases. Findings of the table displays that there was high statistical significant improvement in the performance of the intern-nurses toward medication administration skills after intervention both immediately post and follow-up program. More than half of the observed intern-nurses; the skills that reported as not done was related to checks medication administration report (MAR) for needed information (special instructions) and notes allergies in pre-program and it was decreased in the immediate post program while it was increased in the follow up after three months of the program but still less than pre-program. This in case of effective instructions guide line to teach this topic ,and intern nurse interesting by this topic , as has been seen in previous Discussion 58 studies as well The researchers' role is to foster the development of conceptual and contextual understanding in relation to nursing practice .The nurse teachers strength has been argued to be in their ability to integrate theory with the actual nursing practice [23 & 30].

However, medication care is based on interdisciplinary communication and collaboration. Therefore the development of medication safety and education would benefit from multidisciplinary collaboration and it would be optimal to combine the strengths of teachers form different disciplinary backgrounds. The main results indicate some deficiencies in students' medication competence although the results are better than in several international studies [6, 9,11, 28 & 34 ]. However, there is only a minor improvement in pharmacological knowledge and medication calculation skills.

Related to correlation coefficient between intern-nurses medication administration skills and their attitude toward medication errors the finding of this study indicated that there was positive statistical significant correlation between intern-nurses' attitude toward causes of medication errors and medication administration skills. This means when intern-nurses' attitude toward causes of medication errors is increased their skills toward medication administration is improved. The need to develop the teaching materials to mimic the complex real-life medication management activities of nurses is evident. Medication management has become more and more technology-driven, and teachers need contemporary equipment and teaching versions of electronic patient and medication records to provide efficient and meaningful education [27& 33]. Thus, there are challenges in purchasing contemporary teaching materials in the current economic climate.

Most evident relationship exists between students' efficiency and individual factors, as also supported by Ramjan, et al., (2014) [34].

## **VI. Conclusion**

1. More than half of intern-nurses had a Secondary school, ranged from 22-< 23 years, were female and single , more than half of them, were distributed in medical department, ,they hadn't any previous training regarding medication administration.
2. There was a highly statistically significant improvement in total level of intern-nurses' attitude, knowledge and performance after Instruction Guidelines through different phases.
3. There was highly statistically significant difference in intern-nurses' attitude toward causes of medication errors ( $p < 0.001^{**}$ ) through phases of the Instruction Guidelines.
4. The study indicated that there was a positive statistically significant correlation between intern-nurses' attitude toward causes of medication errors and medication administration skills.

## VII. Recommendations

According to study Conclusion the following is recommended:

- 1- The instruction guidelines about medication administration & errors should be applied & evaluated periodically on different clinics.
- 2- The instructive booklet should be distributed in all hospital departments ought to increase nurses' competences.
- 3- Improvement level of intern-nurses' attitude by structured curricula based on competency

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