

## Training Strategies: Effect on the Nurse Interns' Medication Administration Safety

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### Abstract

**Background:** Medication administration is an important part of delivering quality nursing care. The nurse intern should follow the specific guidelines to enhance their medication administration safety. **Aim:** The study aims to assess the effect of training strategies on the nurse intern's medication administration safety. The research hypothesis was that the implementation of the training strategies affect on the nurse intern's medication administration safety. **Subjects and methods:** The study was conducted at Ain Shams University Hospitals using a pre-experimental one group pretest, posttest design on 90 nurse intern. Three tools were used in data collection, namely medication administration knowledge questionnaire, an observational checklist for safety performance, and an attitude rating scale. **Results:** The results revealed that none of the interns had satisfactory knowledge in pretest; this significantly improved after implementation of guidelines (52.2%) also in follow up phase (58.9%). The pre-intervention adequate practice was 28.9%; it significantly improved to 100.0% at the post phase, and slightly declined to 97.0% at the follow-up phase. For attitude, it was positive among 75.6% of interns at the pre phase, and significantly increased to 96.0% at post phase, and to 100.0% at follow up phase. In multivariate analysis, the guidelines were the main independent positive predictor of nurse interns' knowledge, attitude, and practice scores. **Conclusion:** The implementation of the training strategies led to significant improvements in nurse interns' knowledge, practice and attitude, which leads to accepting the predetermined study hypothesis. **Recommendations:** The developed guidelines should be implemented in nursing internship orientation programs. These programs should give more emphasis to medication administration knowledge and practice with more focus on identified gaps and deficiencies. Further research is proposed to investigate the effects of different training styles, and the distractions and barriers that may increase nurse intern's risk of committing medication administration errors.

**Keywords:** Medication administration, Nurse Interns, Safe practice.

### Introduction

Training is a key element to a successful organization; a formal training function can benefit most keep in mind, though, that “some training” is not, necessarily, better than no training. Poor training can have significant negative consequences, so it is essential that adequate thought and planning go into the

development of a training strategy. A training strategy is designed to achieve an educational goal, such as teaching a new skill or updating trainee on changes to the organization policy (Root,2019).

Creating training strategies delivers focused information that offers value to

the trainee by creating an improved skill set, and to the organization by developing a better-prepared staff. Peer training, or on-the-job training, can be an effective training strategy because it stresses teaching trainee through hands-on experience. For peer trainers, choose only that trainee who have significant experience and who have expressed an interest in becoming a trainer. In conjunction with the departmental manager and human resources department, the peer trainers develop step-by-step programs to help bring basic job task proficiency to new employees by conducting hands-on training (Niazi, 2011).

Preventable adverse drug events (ADEs) occurring during the medication use process in hospitals are associated with additional length of stay and healthcare costs (National Coordinating Council for Medication Reporting and Prevention {NCCMERP}, 2015). Prescribing and drug administration appear to be associated with the greatest number of medication errors (MEs), whether harm is caused or not. Systematic reviews of medication administration error (MAE) prevalence in healthcare settings found that they were common (Keers et al., 2013; McLeod et al., 2013), with one reporting an estimated median of 19.1 % of 'total opportunities for error' in hospitals. A significant proportion of MAEs are associated with actual or potentially harmful effects (Kale et al., 2012).

The Medication Administration Process (MAP) is, predominantly, a nursing responsibility that has been estimated to consume approximately 40% of nursing practice time (Huynh et al., 2016). The MAP has become increasingly complex due to escalating patient acuity, numerous generic and trade medication names, expanded medication delivery routes, increased use of new and diverse

medication safety technologies, and an increased number of medication orders.

The lack of standardization of the MAP is also a key contributing factor in medication administration complexity (Pirinen et al., 2015)

In an effort to reduce Adverse Drug Effects (ADEs), health care leaders and organizations have updated safety principles and practices, i.e., how errors are examined, understood and addressed (Jeffs et al., 2015; Keiffer et al., 2015; O'Byrne et al., 2016; Dante et al., 2016). System approaches and analyses to reduce medication errors and ADEs include strategies such as electronic health records (EHR), computer physician order entry (CPOE), bar code medication administration systems (BCMA), and structured prescribing forms. Despite these strategies, ADEs, and more specifically medication errors, have remained a common occurrence. (Chenot and Daniel, 2010; Donaldson et al., 2014)

Focusing on nurses' attitudes and skills with updated safety concepts may provide insight into the design and implementation of effective system- and nurse-level interventions to minimize medication administration errors MAEs). Nurses need to recognize the challenges they face when administering medications to their patients. Because nurses consistently administer medications, they are well positioned to prevent medication errors. Nurses must be prepared to not only catch their own errors, but also the errors of healthcare providers, pharmacists, and others in the chain of medication administration (Choo et al., 2010).

The process of educating nursing interns about medication safety is multifaceted, and involves teaching not only safe dose ranges, but the clinical judgment and clinical reasoning required to deal with medication side effects, as

well as the many other. Safety steps or rights of medication administration involved with patient care. The increasing technology at the bedside requires nursing faculty to be more efficient and creative in order to allow pre-licensure interns medication administration experiences. Nursing faculty members need a mechanism such as a Safe Medication Practices (SMP) seminar and Medication Administration Toolkit (MAT) that will provide a succinct place to refer to in order to assist students with this process (Sharon, 2013).

### Significance of the study

In Egypt, there are many studies conducted to assess medication administration errors by nurses. The study, which was done by (Mosa, 2016) on nurses application of safety measures related to Medication administration in medical surgical departments at Naser City Hospitals. It found that the most common nurses' errors during medication administration in preparing and administering medication by different routes. Also the study of (Abu al-Majd, 2002) to investigate the relationship between the work site and the occurrence of medication errors in Assiut University Hospitals. It was found that there were (87.0%) errors in medication administration.

The nurse internship program is a very critical period because it facilitates nurse intern's transition from theory to practice and prepared them to take responsibility on their performance. However, the researchers observed that nurse interns had inadequate performance related to administration of medication by intramuscular and oral route that lead to medication errors. This might be due to limited knowledge and skills in the actual clinical situations. So the current study aims to assess the effect of training

strategies on the nurse intern's medication administration skills

### Aim of the study

The study aims to assess the effect of training strategies on the nurse intern's medication administration safety.

### Research hypothesis:

The implementation of the training strategies effect on the nurse intern's medication administration safety.

### Subjects and Methods

#### Research design

Pre -experimental one-group pre-posttest design was used in carrying out this study.

#### Study setting

The study was conducted at Ain-Shams University Hospitals where nurse interns are having their training internship program. These include Ain-Shams University Hospital, El-Demerdash Hospital, Pediatrics University Hospital, and Cardiovascular Hospital.

#### Subjects

Study populations are nurse interns enrolled in the internship year 2018-2019

#### Sample size

The sample size was 90 nurse interns. This number was calculated by Abu al-Majd, (2002) who found that the improvement and the difference ranged from 64.2% to 80% in knowledge and practice and assuming the power =0.99 and  $\alpha = 0.05$ , and by using PASS 11<sup>th</sup> release the sample size, it was calculated as 90 nurse intern (Machin, Campbell, Fayers and Pinol, 1997).

### Sampling technique

Subject of this study selected randomly by using simple random sample technique.

### Data collection tools

The researchers used three tools to collect the necessary data concerning medication administration guidelines, namely medication administration knowledge questionnaire, an attitude rating scale, and an observation checklist for nurse intern' safety performance.

**Tool I: Medication administration knowledge questionnaire:** This tool was developed by the researchers based on literature review (**Institute of Safe Medication Practice [ISMP], 2017; Potter and Perry, 2016; CARNA, 2015**). It was intended to assess nurse interns' knowledge of medication administration guidelines. The tool consisted of two main parts as follows.

○ Part 1: This was for collection of data about the socio-demographic characteristics of the nurse interns such as age, gender, marital status, residence, pre-university education, and previous training.

○ Part 2: It aimed at assessing the knowledge of the nurse intern regarding medication administration at various phases of the study intervention. It consisted of 40 MCQ grouped under sections reflecting the 4 phases of medication administration, namely general, pre-, during-, and post- medication administration guidelines as the following.

▪ General guidelines (12 questions): e.g., administrating the medication must be based on, etc.

▪ Pre-medication administration (15 questions): e.g. the preparation of medication must include, etc.

▪ During- medication administration (8 questions): e.g., nurse can administer pharmacy manufacturer medications with an order of, etc.

▪ Post- medication administration (5 questions): e.g. proper handling with waste and sharp objects includes, etc.

▪ **Tool II: Attitude rating scale:** This tool was developed by the researchers based on related literature review (**World Health Organization, 2017; Institute of Medicine, 2015; Australian Commission on Safety and Quality in Health Care, 2009**). It was used to assess nurse interns' attitudes toward medication administration at the different phases of the study intervention. The tool consisted of 21 items with a five-point Likert scale responses from "strongly agree" to "strongly disagree." They are grouped under three phases, namely pre-, during-, and post- medication administration as follows.

○ Pre- medication administration (6 statements): e.g., I think that performing independent double check before administering medication is a necessary task, etc.

○ During- medication administration (10 statements): e.g., I feel unable to gain control of the critical situation during medication administration, etc.

○ Post- medication administration (5 statements): e.g., I think the documentation of medication errors leads to decreased punishment, etc.

▪ **Tool III: Observation checklist:** This tool was developed by the researchers based on pertinent literature review (**ISMP, 2017; Potter and Perry, 2016; Mohamed, 2004**). It was intended to assess nurse interns' practice of medication administration guidelines throughout the

intervention phases of the study. It consisted of 2 main checklists, one for oral and another for IM medication administration.

○ Oral checklist: This consisted of 23 items with a number of sub-items covering the 3 phases of medication administration as following.

▪ Pre- medication administration (7 items and their sub-items): e.g., assess patient condition, take informed verbal consent before administrating a medication, etc.

▪ During- medication administration (8 items): e.g., identify the patient by using at least two patient identifiers, remain with patient until ensure that each medication is swallowed and never leave the medication at patient bedside, etc.

▪ Post-medication administration (8 items): e.g., observe the patient for therapeutic effect of medication and any reaction according to the medication type, record any reaction to medication, etc.

○ IM checklist: This involved 27 items grouped under the 3 phases of medication administration as following.

▪ Pre-medication administration (8 items and their sub-items): e.g., check ten rights of medication, prepare medication from vial/ ampoule by appropriate techniques, etc.

▪ During- medication administration (11 items): e.g., inject the medication with appropriate technique, gently and quickly remove the needle, etc.

▪ Post- medication administration (8 items): e.g., discard the uncapped needle in the sharp box, wash hands, etc.

### Preparatory phase:

The researcher reviewed current and past, local and international related literature using textbooks, scientific articles, periodicals, journals and internet. This served to prepare the tools for data collection as well as in writing the literature review .

The data collection tools were prepared during this phase. They were presented to experts for assessment of their validity. Two types of validity tests were used in this stage, namely face and content validity. Face validity is aimed at verifying that the tool looks like a tool measuring the concepts of medication administration guidelines. The content validity was intended to determine the appropriateness of each item to be included in the medication administration knowledge questionnaire, attitude rating scale, and observation checklists (**Nieswiadomy, 2009**).

The jury groups were consisted of seven experts: two professors of Nursing Administration and two professors of Medical Surgical Nursing at the Faculty of Nursing, Ain Shams University, in addition to two professors of Nursing Administration at the Faculty of Nursing, Cairo University, and one professor of Nursing Administration at the Faculty of Nursing, Tanta University.

The reliability of the attitude scale was assessed through testing its internal consistency. It proved to be highly reliable with Cronbach's alpha coefficient 0.81. As for the observation checklists, their reliability was assessed using the inter-rater agreement method. This was done by the researcher and a trained colleague using the same checklist and independently observing the same nurse intern at the same time. The reliability proved to be high with 100% agreement.

**Results:**

**Table (1):** describe the study sample consisted of 90 nurse interns whose age ranged between 21 and 25 years, median 22.0 years. Approximately two-thirds were females (64.4%), with the majority being single (85.6%). Slightly more than a half were residing in urban areas (53.3%), and had previous work training (52.2%).

**Table (2):** points to statistically significant weak to strong positive correlations between nurse interns' scores of oral and parenteral medication administration practices. The weakest correlation was between the post-oral administration practice and the parenteral during-medication practice and ( $r=0.395$ ). Conversely, the strongest correlation was between pre-oral and pre-parenteral medication practices ( $r=0.853$ ).

**Figure (1):** display that the great majority of the nurse interns in the study sample came from general pre-university high school education (84.4%).

**Figure (2):** illustrate none of the nurse interns had satisfactory knowledge

of the medication administration guidelines before the intervention. This improved to reach 47.8% at the post-intervention phase, and 41.1% at the follow-up phase. These improvements were statistically significant ( $p<0.001$ ).

**Figure (3):** illustrates, slightly more than three-fourth of the nurse interns in the study sample had total positive attitude (75.6%). The percentages of nurses having positive attitudes increased at the post-intervention phase, reaching 96.7%, and continued to improve throughout the follow-up phase to reach 100.0%. These improvements were statistically significant ( $p<0.001$ ).

**Figure (4):** demonstrates low percentages of adequate practice of oral and IM administration of medication among nurse interns in the study sample before implementation of the intervention, and these showed statistically significant improvements at the post and follow-up phases ( $p<0.001$ ). Overall, only 28.9% had adequate total practice at the pre-intervention phase. This rose to 100.0% at the post-intervention phase, and slightly declined to 97.8% at the follow-up phase. These changes were statistically significant ( $p<0.001$ ).

Table (1): Personal characteristics of nurse interns in the study sample (n=90).

	Frequency	Percent
<b>Age:</b>		
21-22	58	64.4
23+	32	35.6
<b>Range</b>		21.0-25.0
Mean±SD		22.5±0.8
Median		22.0
<b>Gender:</b>		
Male	32	35.6
Female	58	64.4
<b>Marital status:</b>		
Single	77	85.6
Married	13	14.4
<b>Residence:</b>		
Urban	48	53.3
Rural	42	46.7
<b>Previous work training:</b>		
No	43	47.8
Yes	47	52.2
<b>Training duration (months):</b>		
Range		0.0-8.0
Mean±SD		1.7±1.9
Median		1.0

Table (2): Correlation between nurse interns' practice of oral and parenteral medication administration.

Parenteral medication Administration Practice	Spearman's rank correlation coefficient		
	Oral medication administration practice areas		
	Pre	During	Post
Pre-medication	.853**	.561**	.570**
During-medication	.523**	.553**	.395**
Post-medication	.588**	.485**	.740**

(\*\*) Statistically significant at  $p < 0.01$

Figure (1): Distribution of nurse interns in the study sample by type of pre-university education (n=90).

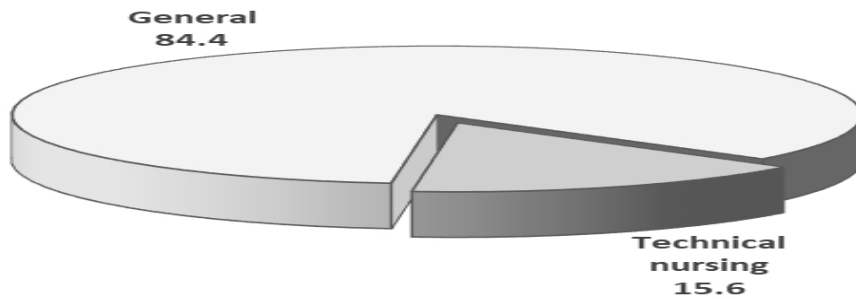


Figure (2): Nurse interns’ total knowledge of medication administration guidelines throughout intervention.

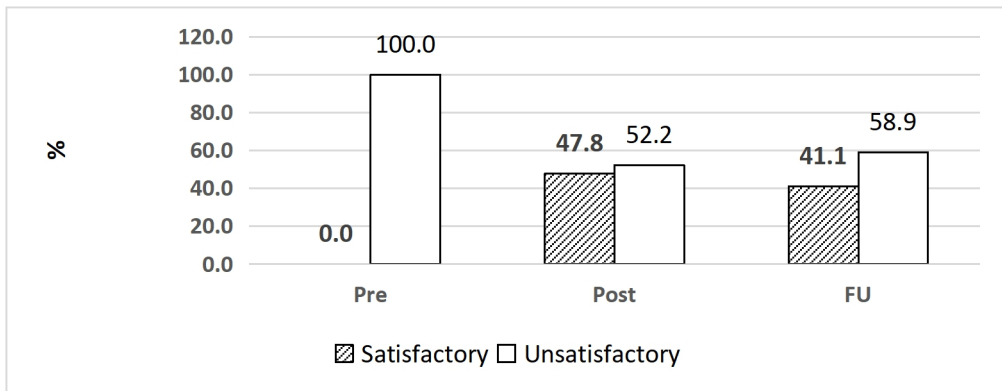
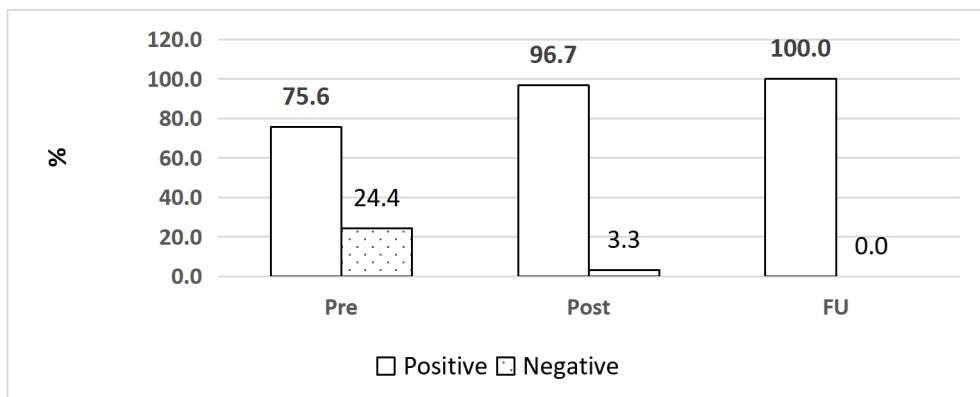


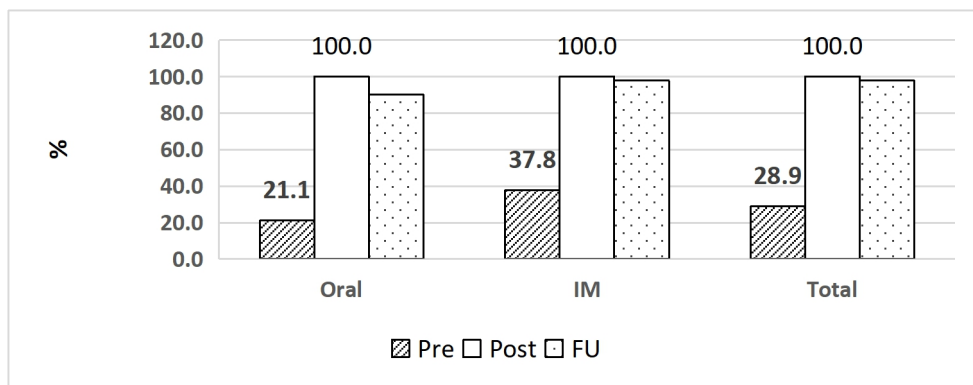
Figure (3): Nurse interns’ attitude towards medication administration guidelines throughout intervention.



(\*) Statistically significant at p<0.05



**Figure (4): Nurse interns' total practice of medication administration guidelines throughout intervention.**



(\*)(\* Statistically significant at  $p < 0.05$ )

## Discussion

Successful internship programs should be those in which teaching and learning are provided to help the new graduate nurse make the transition from novice to advanced beginner who can demonstrate acceptable performance and cope in real situations (**Al-mahmoud, Dorgham and Abd el-megeed, 2013**).

The present study was carried out to assess the effect of training strategies on the nurse intern's medication administration safety. The results indicate unsatisfactory knowledge and inadequate practices of medication administration among nurse interns. The implementation of the training strategies affect on the nurse intern's medication administration safety which lead to acceptance of the study research hypothesis.

The study sample consisted of the randomly selected nurse interns enrolled in the internship program of 2018/2019. They represent the population of the nurse interns in all national programs, with an average age of 22 years, and

mostly unmarried given that the age at marriage is gradually increasing, especially among the highly educated and the professionals. It is also noticed that the percentage of male nurse interns in the sample exceeds one-third, which reflects the increasing numbers of male students enrolled in nursing school worldwide as discussed by **Schwamm (2019)**.

According the current study findings, the nurse interns had unsatisfactory knowledge of medication administration before the intervention. This was noted in all areas of knowledge tested. Such deficiency might be attributed to the learning style and educational system in the most schools and universities, where learning is mainly dependent on recall. In such system, the acquired knowledge fades out quickly. Thus the nurse interns would certainly forget most of knowledge they have acquired during their study years. Congruently with this, a study in Saudi Arabia revealed that the recall of

knowledge was influenced by the educational system and learning styles (AlMohanna et al,2018) .

The forgoing present study finding is consistent with **Elsayed (2013)** whose study in intensive care units at Ain Shams University hospitals reported that, majority of study nurses had unsatisfactory knowledge regarding medication order, preparation, administration ,storage and documentation . on the same line, **Clancy(2014)** the study found that nurses had deficient knowledge of the definition of medication and types of medication errors. Similarly low levels of medications were shown among Ethiopian (**Abdela et al,2017**) Egyptian (**Abd Eltwab ,2018**) and Spanish (**Escriva Gracia at al,2019**) nurses.

However, and in disagreement with these present study findings, **Johari et al (2013)** in a study in Malaysia revealed that the majority of nurses had good medication knowledge. Similarly, **Zakria and Mohamed (2017)** in a study in Egypt reported that the majority of nurses under the study had satisfactory knowledge regarding general pharmacology, medication order, preparation, administration, and high alert medication. Such discrepancies among various studies may reflect differences in the educational systems and the continuing nursing education programs in the settings of these studies

The present study results concerning nurse interns' attitude are in congruence with the results reported by **Elsayed (2013)**who stated that only one-fourth of the nurses in intensive care units at Ain Shams University hospitals, Egypt had negative attitude regarding medication administration. On the same line, **Johnson and Thomas(2103)**in a study in Odisha found that the majority of the nurses had positive attitude towards

safe medication administration and thereby avoid errors. Additionally, **Muzio et al (2016)** reported that the majority of the nurses in Italy had positive attitude towards safe management of medication administration.

These forgoing present study findings are in agreement with **Morphy and While(2012)**who, in a study in British found that ,more than two thirds of the studied nurses had insufficient level of practice regarding medication administration .on the same line **Gaafar,(2015)**, highlighted that, nurse interns' deficient practice of medication administration might be due to lack of standardized nursing care records, procedure book and medication guidelines.

### **Conclusion**

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The study concluded that there are improvements in the nurse interns' knowledge , practice and attitude throughout the implementation of the training strategies, where their knowledge were changed from unsatisfactory to satisfactory, their practice has changed from inadequate to adequate and also their attitude has changed to a positive one. All these lead to accepting the predetermined study hypostasis"

### **Recommendation:**

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In view on the main study findings, the following recommendations are proposed.

#### **For practice:**

- The development guidelines should be implemented in nursing internship programs as a means of training strategy.

**For education:**

▪ Nursing internship programs should give more emphasis on medication administration knowledge and practice with more focus on identified gaps and deficiencies.

**Further research:**

▪ Investigating the various faculty teaching styles, focus on the distractions and barriers that put students at risk while administering medications in the clinical setting.

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