

Critical Care Nurses Practices' Errors Regarding Medication Administration in Different Critical Care Settings at a Teaching Hospital in Upper Egypt

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Abstract

Background: Medication administration errors are a constant occurrence on the unit, and patient safety must be a focus.

Aim: to assess Critical Care Nurses Practices' Errors Regarding Medication Administration in different critical care settings at a Teaching Hospital in Upper Egypt.

Design: Descriptive exploratory design was utilized to conduct the current study.

Settings: The study was conducted in the following critical care units affiliated to Al Minia University Hospital. The selected critical care units were; medical Intensive care, neurosurgical care, Cardiac care, chest care and finally stroke unit.

Sampling: A convenient sample consisted of 60 nurses was obtained from previously mentioned settings regardless of their personal characteristics.

Tools: Two tools were used; First demographic data of the studied nurses and. Second; medication administration checklist to assess nurses' practice concerning medication administration errors.

Results: the observational checklist of nurses' practices in preparation and administration of medications were unsatisfactory. Moreover, the current findings revealed a positive correlation between total practice and age as well as nurses' years of experience. On the other hand, negative correlation was found between nurses' practice and nurse-patients ratio.

Conclusion: practice was unsatisfactory in preparation and during administration of medications in different critical care units regardless of their demographic qualifications.

Recommendations: Continuing nursing education about types of errors that occur in the use of high alert medications and double check of administered medication.

Introduction

A medication error is defined as "any unavoidable incidence of errors that may lead to patient harms [1]. Previous Studies revealed that the incidence of medication administration errors is high with the estimate ranged from 28% to 99% (16,18-20). Wudma Alemua TB, Ibrahim Yimam, WHO World Health Organization [2-6]. Such incidence of errors is considered the most common medical errors in acute care settings. They influence patient safety, length of hospitalization days, and costs [7, 8].

Drug administration process is an everyday part of nurses' duties [1, 9, 10]. It is reported that nearly 64.6% of nurses have executed medication errors. However, 39.9% of these errors are not reported by nurses, denoting that the incidence of medication errors done by nurses is higher than reported [11].

In all clinical settings, there are five phases of the medication process: Prescription, dispensing, administration, and monitoring and reporting [12]. Nurses assume the primary part and are responsible

for all these phases except prescribing the medication [13]. The current study highlighted on the observation of nurses in administering phase and investigated the medication errors induced by nurses. Medication administration five rights are emphasized in the delivering medications in various clinical guidelines to prevent nurse related errors [14]. As well, medication administration errors can occur through unsuccessful acts in any of these ten rights which are right patient, right medication, right time, right dose, right route, right education/advice, rights to refuse, right assessment, right evaluation/ response, and documentation [15-18].

Principally, the administration phase in the delivering of medications, is accounted to be the most common cause of physical disability and death throughout the world. [19, 20]. Occurrence of medication errors can also make patients' hospital stay more longer and resulting in increased healthcare costs for hospitalized patients, and their families [21].

Empirical observations from clinical experience at various clinical settings found that nurses carry out mistakes and immoral acts pertinent to medication administration. Normally, there are limited relevant findings related to medication administration errors in African countries, particularly in Egypt. In addition, previous studies were focused on the five rights of medication administration and the magnitude of the problem regarding that issue and its correlates were left unknown. Therefore; the main aim of this study was to assess critical care nurses' practices' errors regarding medication administration in different icu settings at al Menia Teaching Hospital in Egypt.

Subjects and Methods

Subjects

A Convenient sample of 60 nurses on duty and work in critical care units and administer medication to their patients were included in the current study regardless of their demographic characteristics Setting.

The current study was carried out at five critical care units affiliated to Minia University Hospitals. The selected ICUs were traumatic intensive care unit, neurosurgical intensive care unit, cardiology care unit, chest intensive care unit, and stroke care unit).

Design

Descriptive exploratory design was utilized to conduct the current study.

Tools for data collection

Two tools were used for data collection. These tools were formulated by the researchers after review of related literature and previous studies.

Tool 1: knowledge assessment structured questionnaire: It included two parts:

Part one: it included nurses' demographic data such as sex, age, educational level, work area and years of experience.

Part two: Observational checklist of medication errors:

The observational checklist was developed by the researchers based on thorough literature review and used to evaluate nurses' practices in medication administration. The entire checklist included 35 action steps. The checklist included three main categories; nursing performance during medication preparation (20 items), nursing practices during medication administration (10 items), nursing practices after medication administration (5 items). Each complete and correct done step obtained one score, and "not done" or incorrect action step obtained take zero score. The Satisfactory practice level was $\geq 80\%$ and more. And unsatisfactory practice level was $< 80\%$ [22]. The developed tools were reviewed and investigated by a panel of five experts in the field of medical surgical nursing department and medical staff related to critically ill specialty in {Minia University and Cairo University - Faculty of Nursing. All jury members agreed that current study tools were valid and relevant to the aim of the study. Reliability was done to identify the extent to which the tools items were related with each other, The internal consistency measured to identify the extent to which the items of the tools measure the same concept and correlate with each other by Cronbach's alpha test as 0.875.

Ethical Considerations

An official permission to conduct the study was obtained from the ethical committee in the faculty of nursing at Minia university. As well, written consents and permission were also obtained managers of critical care units affiliated to al Minia university hospitals. Confidentiality and anonymity of each subject was ensured through coding of all data and protecting the obtained data.

Procedure of Data Collection Process

The researchers initiated the collection through obtaining the schedule shift of nurses and in their break time, the researchers put their plan to observe the nurses during administration of medications to their patients in morning and afternoon shifts utilizing observational checklists. The data collection lasted for seven months starting from september 2019 to march 2020.

Data Analysis

The collected data was reviewed, organized, categorized and tabulated. Later, data entry and analysis were carried out through SPSS22 statistical software package Quantitative data was presented in the form of mean, standard deviation. As well, x²- test was used for comparison between two means. Qualitative data was presented in the form of numbers and percentage. It was analyzed by fisher exact test with the level of significance at ≤ 0.05 .

Results

Section (I) demographic characteristics of the study subjects.

Table 1: Demographic characteristics of the nurses (n = 60).

| variables N % | | |
|-----------------------------------|----|------|
| Sex | | |
| Male | 30 | 50 |
| Female | 30 | 50 |
| Age | | |
| 20–29 | 28 | 46.7 |
| 30–39 | 16 | 26.7 |
| ≥ 40 year | 4 | 6.7 |
| Mean + SD 28.47 ± 6.905 | | |
| Educational level | | |
| Secondary school diploma | 13 | 21.7 |
| Technical | 37 | 61.6 |
| Bachelor | 10 | 16.7 |
| Years of experience in ICU | | |
| 1–3 | 31 | 51.7 |
| 4–6 | 13 | 21.7 |
| 7–10 | 9 | 15 |
| ≥10yrs | 2 | 3.3 |
| Time of Shift | | |
| Morning | 33 | 55 |
| Afternoon | 17 | 28.3 |
| Night | 10 | 16.7 |

Table (1) Most of nurses, their age ranged between 20-29 years with the mean age 26.7+1.30 years. Regarding nurses' level of education, 61.6% were technical institute graduates. Concerning years of experience, 51.7%, their years of experience were 1-3 years. Finally, 55% of nurses working in morning shifts.

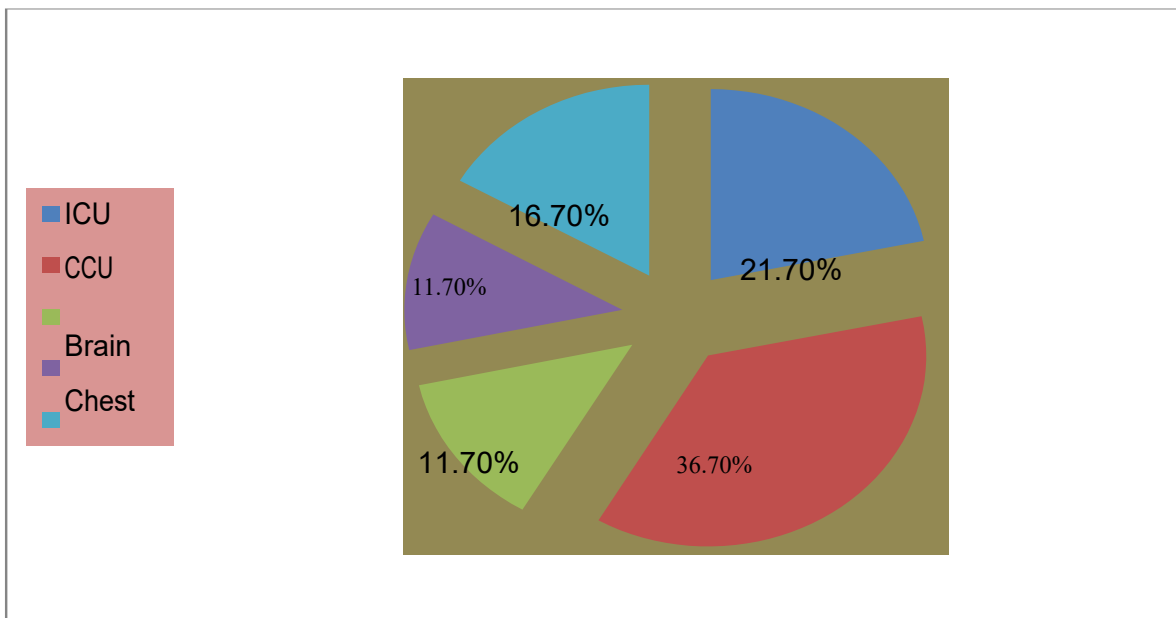


Figure 1: Frequency distribution of nurses by their work area (n=60).

Figure 1

Shows that more than one third of nurses were working at the CCU (36.70%) and the lowest percentage of study sample were at the chest unit (11.70%).

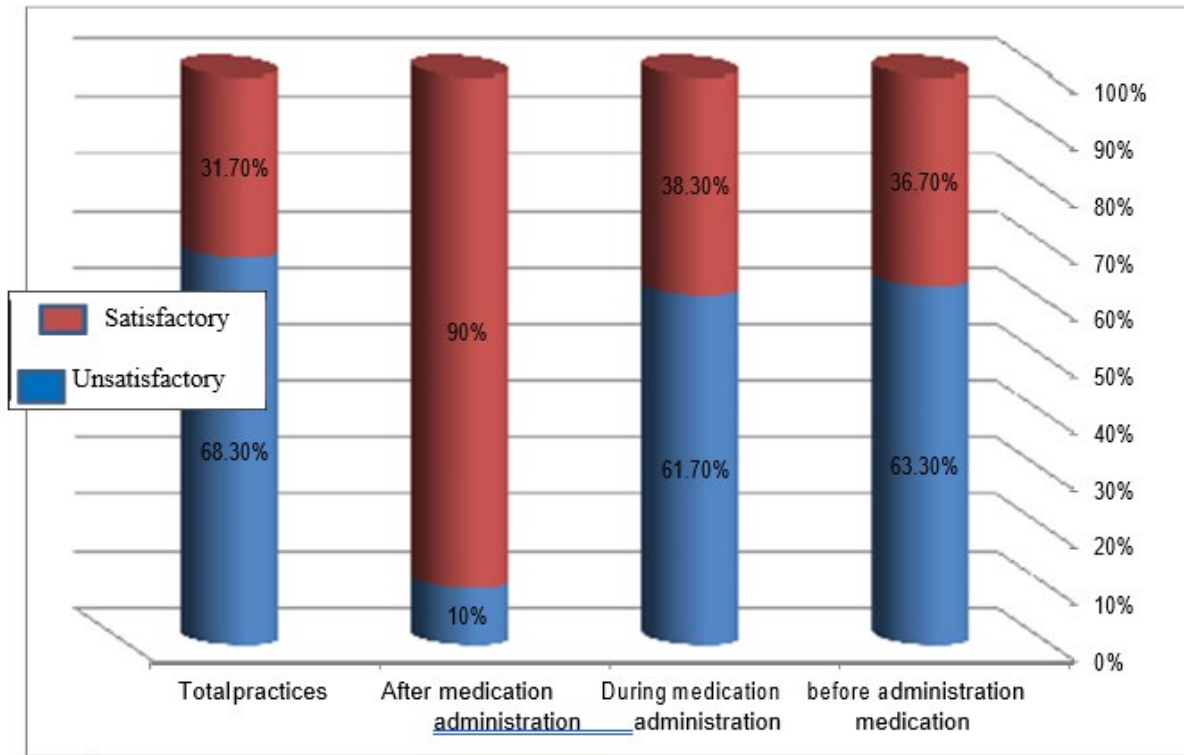


Figure 2: Frequency distribution of nurses' practices level before, during and after medication administration (n=60)

Figure 2 illustrated that almost two thirds (63.30%) had unsatisfactory practices in preparation of medication. While most of nurses (90%) had satisfactory practices after administration of medications.

Table 2: Nurses' mean practice score regarding phases of medication administration (n=60)

| Aspect of practices | mean | SD | Min | Max | Range |
|----------------------------------|-------|------|-----|-----|-------|
| Preparation of medication | 13.65 | 3.33 | 9 | 20 | 11 |
| During medication administration | 6.07 | 1.61 | 3 | 10 | 7 |
| After medication administration | 3.37 | 0.84 | 1 | 5 | 4 |
| Total practice | 23.1 | 4.58 | 14 | 32 | 18 |

Table 2: The overall mean practice score in medication administration was 23.1+4.58 out of 32. So, they gained 13.65 +2.97 out of 20 in Preparation of medication. As well, they got unsatisfactory mean practice score 3.37+0.84 out of 5 after medication administration.

Table 3 Frequency distribution of nurses' done/not done practices in preparation of medication (n =60).

| Practice Items | Done | | Not done | |
|---|------|------|----------|------|
| | N | % | N | % |
| 1-Checked a valid, prescribed drug in the medication record | 1 | 1.7 | 59 | 98.3 |
| 2-Washed hands before handling medication | 27 | 45 | 33 | 55 |
| 3-Prepared the necessary equipment | 26 | 43.3 | 34 | 56.7 |
| 4-Double checks the drug name and dosage with the prescribed drug the record | 38 | 63.3 | 22 | 36.7 |
| 5- Labeled syringes and bags with prescribed drugs | 27 | 45 | 33 | 55 |
| 6- Checked the expiry date of prescribed drug | 15 | 25 | 45 | 75 |
| 7- Checked the specific instructions before administration | 41 | 68.3 | 19 | 31.7 |
| 8- prepared the dose correctly | 8 | 13.3 | 52 | 86.7 |
| 9- Checked if patients had any allergies | 30 | 50 | 30 | 50 |
| 10 Checked the right time for each drug | 7 | 11.7 | 53 | 88.3 |
| 11- Checked the last time the drug the drug has been administered | 6 | 10 | 54 | 90 |
| 12- Checked the right prescribed dose of each drug in the chart | 6 | 10 | 54 | 90 |
| 13-- Checked the prescribed route | 0 | 0 | 60 | 100 |
| 14- Used medicine pots, cups or spoons to avoid making contact with the drug. | 31 | 51.7 | 29 | 48.3 |

Table 3: It is apparent that nearly two thirds of nurses (68.3 %) didn't check instructions and special precautions regarding administration of drugs. On the other hand, most of nurses (100%) checked the prescribed route of administration, prescribed dose, checked the last time the medication has been administered accurately.

Table 4. Frequency distribution of the study group done/not done practices during the administration of medications.

| Practice Items | Done | | Not done | |
|---|------|------|----------|------|
| | N | % | N | % |
| 1-verified the patient's identity prior to administering medication | 1 | 1.7 | 59 | 98.3 |
| 2- Communicated information sensitively to the patient before and during administration of medication | 36 | 60 | 24 | 40 |
| 3- Administered the prepared medication immediately following preparation | 13 | 21.7 | 47 | 78.3 |
| 4-Observed the patients for side effects | 28 | 46.7 | 32 | 53.3 |
| 5-Stayed with the patient until the drug has been Swallowed the drug | 19 | 31.7 | 41 | 68.3 |

Table 4: Showed that two thirds (60%) of nurses didn't Communicate the information sensitively to the patients prior to and during administration of medication. As well, 58.3% of nurses didn't record monitoring data related to administered medication. On the

other hand, most of nurses (98.3%) verified the patient's identity prior to administering medication. Moreover, approximately three fourth (78.3%) of nurses administered all prescribed medications immediately following preparation.

Table 5 Frequency distribution of the study group done/not done practices after administration (n=60)

| Practice Items | Done | | Not done | |
|--|------|------|----------|------|
| | N | % | N | % |
| 1- Recorded monitoring data related to administered medication | 35 | 58.3 | 25 | 41.7 |
| 2- Reported the abnormal findings to physician | 0 | 0 | 60 | 100 |
| 3- Demonstrated knowledge accurately related to administered medication with patient | 24 | 40 | 36 | 60 |
| 4-Reassured that information is soundly understood by patients | 27 | 45 | 33 | 55 |
| 5- Documented any delay or omission in the nursing notes | 46 | 76.7 | 14 | 23.3 |
| 6-Disposed non-administered and wasted drugs or sharps in the appropriate container | 15 | 25 | 45 | 75 |
| 7-Signed in the medication administration record as soon as the medication has been administered | 36 | 60 | 24 | 40 |
| 8-Stayed with patient for several minutes to observe any side effects | 30 | 50 | 30 | 50 |
| 9- Cleaned their hands between patients | 40 | 66.7 | 20 | 33.3 |

Table 5: As can be seen from table (5) that the nurses disposed non-administered and wasted drugs or sharps in the appropriate designated sealed container step no (23,27). While all nurses (100%) Reported the abnormal findings to physician

Table 6 Comparison of nurses' practices by their demographic characteristics (n=60)

| Practice Items Demographic variable | Satisfactory | | Unsatisfactory | | Fisher - exact (p value) | P value |
|--|--------------|------|----------------|------|------------------------------|---------|
| | N | % | N | % | | |
| Age | | | | | | |
| 20-29yrs | 34 | 56.7 | 14 | 23.3 | 1.078 | 0.60 |
| 30-39yrs | 3 | 5 | 3 | 5 | | |
| ≥40yrs | 4 | 6.7 | 2 | 3.3 | | |
| Gender | | | | | | |
| Male | 22 | 36.7 | 8 | 13.3 | 0.693 | 0.58 |
| Female | 19 | 31.7 | 11 | 18.3 | | |
| Years of experience | | | | | | |
| 1-3 yrs | 21 | 35 | 10 | 16.7 | 0.89 | 0.96 |
| 4-6yrs | 13 | 21.7 | 5 | 8.3 | | |
| 7-10rs | 6 | 10 | 3 | 5 | | |
| >10yrs | 1 | 1.7 | 1 | 1.7 | | |
| Educational level | | | | | | |
| Diploma | 10 | 16.7 | 3 | 5 | 0.82 | 0.67 |
| Technical | 25 | 41.6 | 12 | 20 | | |
| Bachelor | 6 | 10 | 4 | 6.7 | | |
| Type of Unit | | | | | | |
| ICU | 10 | 16.8 | 3 | 5 | 4.88 | 0.30 |
| CCU | 17 | 28.3 | 5 | 8.3 | | |
| Neurosurgical | 3 | 5 | 5 | 8.3 | | |
| Chest | 5 | 8.3 | 2 | 3.3 | | |
| Stroke | 6 | 10 | 4 | 6.7 | | |

| Shift time | | | | | | |
|----------------------|----|------|----|------|------|------|
| Morning | 23 | 28.3 | 10 | 16.7 | 0.51 | 0.86 |
| Evening | 12 | 20 | 5 | 8.3 | | |
| Night | 6 | 10 | 4 | 6.7 | | |
| Nurse patient ratio | | | | | | |
| 1 patient | 4 | 6.7 | 1 | 1.7 | 1.57 | 0.60 |
| Two patients | 17 | 28.3 | 7 | 11.7 | | |
| Three patients | 15 | 25 | 10 | 16.6 | | |
| More than 3 patients | 5 | 8.3 | 1 | 1.7 | | |

Table 6 As can be seen no differences what so ever between nurses' practices by their demographic characteristics

Table 7 Correlation between selected nurses' demographic variables and total practice (n=60).

| Variables Total practice | R and p value |
|--------------------------|------------------|
| Age | r=0.91; p= 0.00 |
| Years of experience | r=0.58 ; p= 0.00 |
| Nurse Patient ratio | r=0.28 ; p=0.027 |

Table 7 Showed that there is a positive correlation of total practice with age (R=.914, P=.000), and Years of experience (R=.580, P=.000). On the other hand, a negative correlation was existed between patient number and total practice.

Discussion

The current discussion covered the following sections, First finding related to demographic characteristics, second findings related nurse's practices regarding medication errors. And finally, correlation and additional findings pertinent to the study. Concerning frequency distribution of nurse's practices' errors regarding medication administration in different critical care settings at a teaching Hospital in Upper Egypt. The present result showed that only more than one-third of nurses had satisfactory practices level in the preparation of medication and during medication administration. On the other hand, the majority of them had satisfactory level of practice after drug administration and only one third of them had total satisfactory performance about drug administration. So, the nurse obtained low mean practice scores in preparation of medications and, during administration when compared to post administration. This happening may due to lack of training, inaccessible guidelines for medication administration, interruption while administering medication, limited communication with another nurse when they encountered a problem, and inability to adhere to rights of medication administration.

This result come in the line with Abd Elmageed et al., who studied the knowledge, attitude and practice of nurses in administering medications at Mansoura University Hospitals who revealed greater than three quarters of the nurses have got unsatisfactory practice score with respect to drug preparation as well as nurse's had got unsatisfactory practice level regarding medication administration [23]. Besides, Wabe et al., who studied in North West Ethiopia knowledge, attitude and practice of patients' medication counseling among drug dispensers who reported that post medicine practice requires improvement [24]. This finding might be ascribed to

the persistent workload that makes the nurses practice described by low-level of performance.

Regarding the nurses' done/not practices during preparation of medication, the current study revealed that almost three fourth of critical care nurses didn't check instructions regarding administration of drugs. This may have relevant to absence of monitoring and follow up of nurses' action steps during administration of medication. The present finding contradicted with Mahesh et al., who studied nursing perceptions of medication administration practices, reasons for errors and reporting of errors in a tertiary care hospital in Bangalore and reported that the majority of nurses consistently checked the composition of the medication before administration [25]. This outcome is confirmed by Westbrook et al., who detailed that most of the contemplated nurses didn't aware of drug protocol [26].

Concerning the nurses' checking the prescribed route and form of each medication, the current study showed that the greater part of nurses checked the prescribed route and form of each medication for validity and clarity of each drug, as well as checked the prescribed dosage, time and administered dose accurately. This finding is consistent with Karttunen et al., & Gilani, who studied nurses' adherence to guidelines on safe medication preparation and administration in long-term elderly care and revealed that most nurses guaranteed to consistently prepared medications as indicated by the relevant guidelines [27, 28]. As well, our finding is matched similar study done by Bucknall et al., 2019 who studied nurses' decision-making, practices and perceptions of patient involvement in medication administration in an acute hospital setting and showed that most of the contemplated nurses checking

patient identification, the drug name, the dosage, the route and the scheduled time prior to giving drug [29].

Regarding the observation of critical care nurses' practices during administration of medications, the current study showed that two thirds nurses didn't communicate information sensitively to their patients before and during administration of medication. This finding is inconsistent with Bucknall et al., 2019 who found that the most of the contemplated nurses provided patient with required education about delivered medication [29].

On the other hand, most of nurses confirmed the patient's identity before administering medication, and they disposed non-administered and squandered drugs or sharps appropriately. This finding is congruent with **Karttunen et al.**, who stated that over half the participants administered medication to their patients in accordance with the provided guidelines [27]. Also this result come in accordance with **Bucknall et al.**, who revealed that the majority of the considered nurse checking patient identification prior to giving drugs [29].

The present study showed that greater than half of critical care nurses didn't records monitoring data related to administered medication. On the other hand, all nurses reported the abnormal findings to physician. This finding may be related to the nurse's work overload as well as the lack of policy that guide medication administration. The current finding is agreed with **Westbrook et al.**, who found that the studied nurses ignored following medication rules in recording the observations pertinent to the administered drug [26]. On the contrary, the current finding is not agreed with **Kirubakaran&Amirtham**, who examined knowledge and practice of intensive care unit nurses on intravenous drug administration and reported the majority of the contemplated nurses were adherent to nursing practice of the medication administration protocol [30].

Regarding comparison of the studied nurses' practices by their educational level, the current study showed that there were no significant differences were found in practice mean score regarding drug administration. This finding is agreed partially with **Fattah et al.**, who studied effect of maternity nurses knowledge and Practices regarding the medication errors on women safety in labor unit and found no statistically significant differences between the maternity nurses level of practices, their qualification and source of information regarding the drugs used in labor unit and precautions of drugs administrating [31].

Regarding the correlation between age, years of experience, patient number, and total practices among critical care nurses, the current study indicated that there were strong positive correlations between the age of the staff nurses with their total practices, and moderate positive correlations between years of experience with their total practices. This finding may due to that nurses acquired experience from their work area. But there was a negative fair as-

sociation between patient number and nurses' practices. This result was supported by **Bakr Abo El-Ata et al.**, who stated that there were true positive correlations between nurses' demographic characteristics and total observational performance [32]. Likewise, this finding is agreed with **Fattah et al.**, who revealed that there was a significant correlation between the level of practice in medication administration among nurses and their age and span of experience [31]. Moreover, our finding is consistent with **Fattah et al.**, who revealed that there was a high significant correlation between the nurses' practices in drug administration and their age, total years of experience, while, found no correlation between the maternity nurses' practices level and their educational level [31]. On the other side, our findings are contradicted with **Theresa**, who studied effectiveness of planned teaching program on knowledge and practice regarding safe medication administration among staff nurses and revealed that all demographic variables are not significantly associated with their pretest score of practice level [33].

Regarding the nurse-patients ratio in the present study, it showed that greater than one third of nurses were caring for three patients followed by 40% who caring for two patients. This may be due to available number of nursing in critical units was few. This result come in the line with who studied the correlation between medication errors with job satisfaction and fatigue of nurses and reported that the nurse in ICU or CCU are responsible for two to three patients [34]. As well, this finding is supported by Johnson et al., 2017 who stated that nurse –patient ratio is identified by patients' condition status and the accessible number of nurses [35].

Conclusion

More than one third of critical care nurses in different work areas committed Common medication administration errors that occurred during preparation such as not checking the prescribed drug in medication record, not checking the right prescribed dose, route, time of administering medication. While, during administration of medications, most of nurses didn't verify the patient's identity prior to administering medication, didn't Administer the prepared medication immediately following preparation and didn't Stay with the patient until the drug has been Swallowed the drug in case of administration of oral tablets

Recommendations

- Continuing nursing education about types of errors that occur in the use of high alert medications.
- Well-designed workflow within the critical care units should be advised in a manner to improve nurses' communication and minimizes interruptions.
- Double check of administered medication should be recommended.

Limitation of the study

The current design used in this study does not confirm the presence of a definitive cause and effect relationship. The sample size was relatively small. As a result, the number of critical care nurses

enrolled in this study might have provided the absence of a significant association between some of the contributing factors and MAEs, as well as to the generalizability of the present findings.

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