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Assessing Nurses' Knowledge of Medication Administration Safety Practice and Factors Contributing to Errors

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Abstract: Background: In the majority of practice settings, nurses play a crucial role in administering medications. It is the responsibility of nurses to make sure they possess the information, skills, and abilities needed to safely and properly dispense drugs in order to avoid any mistakes. Aim: Assess Nurses' Knowledge of Medication Administration Safety Practice and Factors Contributing to Errors. Methods: A descriptive correlational design was used when carrying out the research with a convenient sample of (98) nurses assigned to work in care in all medical and surgical departments at Mansoura University Hospital. Data was collected using Medication Administration Safety Practice Knowledge Questionnaire and Medication Administration related Factors Questionnaire. Results: Majority of nurses have poor level of knowledge of Medication Administration Safety Practice and there is physician, nurse, organization, and patient cause contributing to error. Conclusion: According to the study findings most of studied staff nurses had inadequate knowledge of medication administration safety practice and most factors of medication error is related to physician related causes and followed by nurses related causes. Recommendations: Creating a standardized system that enables error monitoring, reporting, analysis, and review in a constructive environment in order to pinpoint and eradicate mistake sources. Putting in place a medication safety training program for nurses improves their attitudes toward drug safety.
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1. Introduction

One of the primary responsibilities of nurses is the delivery of medication. In order to carry out their jobs in a safe manner, nurses everywhere are professionally accountable, ethically conscious, and educationally equipped. Because of this, nurses are also able to make, identify, and report medication mistakes. The safe administration of drugs is a frequent concern for nurses providing patient care. (Marten, Paliadelis &Perry, 2019).

One of the primary responsibilities of nurses is the delivery of medication. In order to carry out their jobs in a safe manner, nurses everywhere are professionally accountable, ethically conscious, and educationally equipped. Because of this, nurses are also able to make, identify, and report medication mistakes. The safe administration of drugs is a frequent concern for nurses providing patient care (Sindelar, McCabe & Carroll, 2023).

Medication reconciliation, medication preparation and administration, medication education, medication monitoring, medication evaluation, and medication response documentation are all areas in which nurses excel. This document's goal is to offer recommendations for handling different aspects of medicine administration in a clinical context that are both safe and efficient (Latimer, Hewitt, de Wet, Teasdale & Gillespie, 2023).

Today's healthcare environment has made medication administration safety a priority. In order to prevent such adverse drug occurrences, medication safety entails the integrity and proper functioning of several intricate, interconnected stages as well as the collaboration of medical professionals. The intricacy of pharmaceutical administration and usage, particularly in an inpatient context, puts hospitalized patients at serious danger and raises the possibility of medication administration mistakes (Martyn, Paliadelis & Perry, 2019).

Any avoidable incident that might result in improper pharmaceutical usage or patient injury when the medicine is under the care of a medical expert is considered a medication mistake. These incidents might have to do with prescription, order

communication, product labeling, packing, compounding, dispensing, and distribution; administration, education, and monitoring; or health care items, processes, and systems (Naseralallah, Isleem, Aboelbaha, Pallivalapila, Alnaimi & Al Hail, 2023).

Any step of the drug process—prescription, verification, preparation, administration, or delivery—can result in a medication mistake. Given their extensive work schedules, nurses are known to spend a lot of time administering medications. Additionally, studies have shown that 36% of nurses make medication mistakes. Since the majority of drug mistakes are avoidable, better medication process management is required (Reis et al., 2023).

Significance of the Study

The proportion of medication administration errors (MAE) with the potential to harm patients such as permanent disability and death (WHO 2020). The growing population means that there is a greater need for healthcare and nursing services, and more importantly, nurses need to be qualified to use this drug administration safety procedure.

Aim of the study

This study aimed to assess nurses' knowledge of medication administration safety practice and factors contributing to errors.

Research questions: -

RQ1: What is the level of medication administration safety practice knowledge among nurses?

RQ2: What are the factors contributing to medication errors as perceived by nurses?

Methods

Study design:

This study research methodology was descriptive correlational design.

Study setting:

The Mansoura University Hospital, a tertiary care teaching hospital associated with Mansoura University, hosted the trial in all its medical and surgical departments at Main Mansoura. This hospital, which is situated in Mansoura City, is significant since it serves as the main teaching facility for medical education programs.

Study subjects:

Convenience sample was applied which includes all accessible staff nurses (n=98) assigned to work in medical and surgical departments, throughout the data collection period with at least one-year experience to be oriented for working condition.

Data collection tools:

Tool of data collection: -

Tool (I): Knowledge of Medication Administration Safety Practice Questionnaire.

The tool comprises two parts: -

The first part: used to identifying individual traits of the research nurses such as, age, hospital, educational qualifications, years of experience and attending training program.

The second part: It was designed by the researcher based on literature review (Araújo, Lima, Ferreira, Oliveira & Carvalho, 2019) to assess study nurses' knowledge about medication administration safety practice. It consists of questions in the form of true and false and multiple choice (MCQ) that related to medication administration safety practice. For true /false and MCQ questions response was considered as (1) for right answer and (zero) for false answer. One point will give for each correct answer. The % score will be generated from these scores.

Tool (II): Factor of Medication Administration Errors Questionnaire.

It was designed by the researcher based on literature review (Reis et al., 2023) to determine how study nurses perceive nursing staff in relation to the reasons behind drug delivery mistakes and interruptions that result in errors. The researcher categorized nurses' perception under four categories namely, causes related to nurses (13 items), causes related to patients (4 items), causes related to physician (4 items), and causes related to unit (6 items).

Pilot study:

A pilot study was conducted before performing the main study and before beginning data collection. Ten staff nurses (10% of the entire study population) were randomly chosen to participate in a pilot study in order to verify the tools' applicability and clarity as well as to identify any roadblocks and issues during data collection, test clearness of the language and calculated the duration required to determine the time needed to fill-in questions. Participants in the pilot study was not included in the research.

Ethical consideration:

The Research Ethics Committee of Mansoura University's Faculty of Nursing was being consulted in order to gain formal ethical permission. The competent hospital administrator granted formal approval to conduct the study, and participation was entirely voluntary. All data was coded to ensure the subject's confidentiality and anonymity. The study sample's privacy was protected. The results were utilized as part of the required study, as well as for upcoming publications and instruction, while maintaining the confidentiality of the data obtained.

Data collection:

The medication administration safety practice questionnaire was distributed to studied staff nurses took from 15-20 minutes to be finished. Also, Medication Administration related factors Questionnaire took 30 minutes to fill it. The data was

collected in the morning and afternoon shifts on Saturday, Sunday, and Wednesday of each week. Data collection took place over the course of two months, from the start of March 2023 to the end of April 2023.

Statistical analysis:

The data were coded, entered, arranged, and analyzed using SPSS (Statistical Package for Social Science) version 25 (IBM Corporation, Armonk, NY, USA). For quantitative data, the range, mean, and standard deviation were calculated. According to Dawson and Trapp (2001), qualitative data represent a collection of categorical data as a percentage, proportion, or frequency for each category.

Results

Table (1) illustrates Frequency and distribution of the studied nurses according to personal data. It showed that near a half (48%) of studied staff nurses age were ranged from (20-30) years old, most of them were female (95.9%) and were married. Concerning staff nurses' educational qualification (59.2%) were diploma degree, and also half of them (50%) have (10-20) years of experience and most of them wasn't take any training on medication administration.

Table (1): Frequency and distribution of the studied nurses according to personal data (n=98)

Characteristics	No.	%
Age years		
20-30	47	48.0
>30-40	38	38.8
>40-55	13	13.3
Mean±SD	**32.50 ± 7.23**	
Years of Experience		
<10 years	31	31.6
From 10-20 years	49	50.0
>20years	18	18.4
Mean±SD	**14.68±4.87**	
Gender		
Male	4	4.1
Female	94	95.9
Educational qualification		
Diploma of nursing	58	59.2
Technical nursing institute	40	40.8
Marital status		
Married	80	81.6
Not Married	18	18.4
Attending training programs about medication administration		
No	68	69.4
Yes	30	30.6

Table (2) illustrates levels of the studied staff nurse's knowledge about medication administration safety practice. It showed that (60.2%) of studied staff nurses was at low level and (39.8%) was at average level.

Table (2): Knowledge levels about medication administration safety practice (n=98).

Knowledge total score level about medication administration safety practice	Total knowledge level (n=98)	
	No.	%
Low level (0-20)	**59**	**60.2**
Average level (21-27)	**39**	**39.8**
Good level (28-35)	**0**	**0**

Table (3) illustrates causes of medication administration errors related to nurses as perceived by the studied staff nurses at Main Mansoura University Hospital. It showed that interruption

during round is the most common cause of medication errors related to nurses (10.2%). While, lake of nurses' job satisfaction, nurses need more assistance and nurse still gives drugs when stopped by physician were the least common causes of medication errors related to nurses (1.0%).

Table (4) shows the reasons behind patient medication administration mistakes as reported by the staff nurses who were the subject of the study. It showed that plenty of patients in the unit is the most common cause of medication errors related to patients (4.1%). While bad communication between patient and nurses and illiterate patients were the least common causes of medication errors related to patients (1.0%).

Table (3): Causes of medication administration errors related to nurses as perceived by the studied staff nurses at Main Mansoura University Hospital (n=98).

Nurses related **causes of medication administration errors**	**Response of the studied staff nurses**			
	No		**Yes**	
	No.	**%**	**No.**	**%**
• Lack of nurses' understanding of medication (indications, side effects, overdose, adverse response)	89	90.8	9	9.2
• The work satisfaction of nurses in Lake of Lake	97	99.0	1	1.0
• More help is needed for nurses.	97	99.0	1	1.0
• Even when a doctor stops the nurse from giving medication	97	99.0	1	1.0
• During the round, there was a disruption	88	89.8	10	10.2
• Nurses administer more than three medications concurrently to more than three patients	96	98.0	2	2.0
• The burden of nurses has increased	91	92.9	7	7.1
• Ineffective communication between doctors and nurses	96	98.0	2	2.0
• Nurses lack familiarity with the procedure of administering medications.	93	94.9	5	5.1
• During the preparation and delivery of medicine, head nurses did not provide enough supervision.	95	96.9	3	3.1
• A shortage of nurses, particularly during night and late shifts	94	95.9	4	4.1
• When giving medication, nurses do not adhere to the five rights of patients.	92	93.9	6	6.1
• Nurses are unable to distinguish between comparable medications.	94	95.9	4	4.1
Total	**94**	**95.9**	**4**	**4.1**

Table (4): Causes of medication administration errors related to patients as perceived by the studied staff nurses at Main Mansoura University Hospital (n=98).

Patients related **causes of medication administration errors**	**Response of the studied staff nurses**			
	No		**Yes**	
	No.	**%**	**No.**	**%**
• There are several patients in the facility.	94	95.9	4	4.1
• Taking care of several individuals in severe condition	95	96.9	3	3.1
• Poor communication between nurses and patients	97	99.0	1	1.0
• Patients who lack literacy	97	99.0	1	1.0
Total	**96**	**98.0**	**2**	**2.0**

Table (5) illustrates causes of medication administration errors related to physicians as perceived by the studied staff nurses at Main Mansoura University Hospital. It showed that the most common cause of medication errors related to physician was that physician handwriting is not clear (9.2%), while the lowest cause was more than one physician writes medication for the same patient (2.0%).

Table (5): Causes of medication administration errors related to physicians as perceived by the studied staff nurses at Main Mansoura University Hospital (n=98).

Physicians related **causes of medication administration errors**	**Response of the studied staff nurses**			
	No		**Yes**	
	No.	**%**	**No.**	**%**
• The handwriting of the physician is unclear.	89	90.8	9	9.2
• The doctor is unable to clarify medicines.	93	94.9	5	5.1
• Multiple doctors issue prescriptions for the same patient.	96	98.0	2	2.0
• The doctor doesn't make rounds all the time.	95	96.9	3	3.1
Total	**93**	**94.9**	**5**	**5.1**

Figure (1) illustrates causes of medication administration errors as perceived by the studied staff nurses. It showed that the most common cause of medication errors was physician related causes (5.1%) followed by causes related to nurses with (4.1%), then organization related causes with (3.1%) while the lowest cause was causes related to patients with (2.0%).

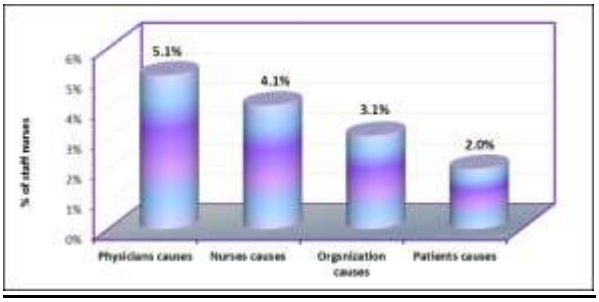

Figure (1): Causes of medication administration errors as perceived by the studied staff nurses at Main Mansoura University Hospital (n=98).

Discussion: -

In the medical field, patient safety is a constant problem. In order to improve the content and quality of patient safety education by providing guidelines and essential competencies for safe patient care, efforts have been made worldwide to increase the presence of patient safety competencies in nursing education. The proper administration of pharmaceuticals is essential to patient safety, yet it may be a difficult procedure carried out by nurses and has significant hazards, such as responsibility for medication administration mistakes (Mulac, Taxis, Hagesaether & Granas, 2021).

As regards to staff nurses' knowledge for medication administration safety practice finding of the present study reveals that staff nurses' knowledge is at low level this may be due to inattentive of regular training program related to medication administration safety practice, beside the inadequate course content they had during their studying educational program or during period of their work after graduate.

Finding of the present study is supported by Fathy, Khalil, Taha & Abd-elbaky, (2020) who conducted study regarding medication errors in critical care units and according to the survey, large of nurses had inadequate general knowledge and medication administration errors (MAEs). They cited insufficient training in this field, a lack of frequent group discussions to refresh their knowledge on medication mistakes, a lack of motivation, and an increase in nursing workload, all of which caused nurses' skills and motivations to acquire and update their knowledge to be delayed.

These results in same line with Kim & Lee, (2020) who conducted study entitled with medication error encouragement training and reported that in comparison to the control group, the experimental group demonstrated a significant increase in drug administration knowledge following the intervention. Therefore, in the present study using of affinity map to determine causes of medication errors based on brainstorming sessions.

This is the same view of Opoku-Danso, Otoo, & Asiedu, (2024) who mentioned medication delivery errors can result in patient mortality, lengthy hospital stays, and unfavorable consequences on nurses. he current study's findings showed that four types of factors—nurses, patients, physicians, and organizations—are responsible for drug administration errors. The results of this study showed that physician-related reasons were the most frequent source of medication mistakes, followed by nurse-related causes, organization-related causes, and patient-related causes, which were the least prevalent.

The current study's findings on the variables associated with drug delivery errors among nurses reveals that nurses' factors could be related to interruption during round was the most common cause of medication errors related to nurses followed by lake of nurses' knowledge related drugs, increase nurse's workload, nurse don't follow patient five

rights of medication administration, he technique of administering medicine is unfamiliar to nurses. The majority of nurses in the current study had inadequate understanding of drug delivery mistakes, according to their knowledge level. This might be the result of a lack of enthusiasm, insufficient training in the field, a lack of frequent group discussions to refresh their knowledge on medication mistakes, or an increase in nursing workload that delayed nurses' willingness and skills to learn new information.

In same vein of Sugimura & Ogasawara, (2024) who conduct a study entitled with Medication error-related incidents and associated elements including nurses' actions to decrease medication mistakes in Japan It found that over thirty percent of errors are caused by inexperienced personnel and higher workloads, while almost half are caused by nurses' inability to focus and the presence of distractions. Inadequate cooperation and communication between nurses and doctors may also be a contributing factor in these errors, in addition to the fact that recent graduates lack professional knowledge and might not be able to identify dangerous circumstances or drugs, lack of knowledge about the drugs was another important aspect.

However, Schroers, Ross & Moriarty, (2021) in their study nurses' perceived causes of medication administration errors found that lack of nurse's medication knowledge other personal factors included fatigue, heavy workloads and interruptions were factors associated with medication errors.

These finding was supported with Alrabadi et al., (2020) who conducted a study entitled with medication errors among registered nurses in Jordan and found that attention and interruption were identified as one of the primary contributing factors to medication mistakes; he suggested that nurses' attention and interruption during preparation and administration may be the reason for the greatest number of medication errors. As well as Strube-Lahmann, Müller-Werdan, Klingelhöfer-Noe & Lahmann, (2020) who conduct study entitled with patient safety in outpatient care study about medication errors and medication management and found that Nurse weariness, physical exhaustion, and inattention can result from severe workloads and staffing shortages, all of which have been linked to MAEs.

Regarding, patient factors related to medication administration error the finding of the present study reveals that plenty of patients in the unit is the most common cause of medication errors related to patients followed by care of large number of critical cases of patients, bad communication between patient and nurses and illiterate patients. In the same vein, these results were similar to Opoku-Danso, Otoo, Asiedu, (2024) who conducted study entitled with medication administration errors among nurses and midwives in Ghana and revealed that patients' attitudes towards drug administration contribute to MAEs.

Along the same vein as Dick-Smith et al., (2023) who carry out research called prevalence and economic burden of medication errors in England and discovered that a medication error may be caused by a hospital administration or emergency room messing up patient information, or by physicians neglecting to educate patients about proper prescription practices.

Regarding, physician factors related to medication administration error, finding of the present study reveals that physicians' font not clear is the most common cause of medication errors related to physician followed by physician not available for medication clarification, physician does not make round continuously and finally the same patient's medicine is written by many doctors. This result comes in the same line with Soori, (2024) who conducted study entitled with errors in medical procedures in medical science investigations and demonstrated that the likelihood of medical mistakes can be raised by physician burnout, which is frequently brought on by stress and strain.

Similarity to Alsabri et al., (2024) who investigate medication errors in pediatric emergency rooms and discovered that less experienced doctors and other human factors, like noncompliance with procedures and communication breakdowns, are risk factors for medication errors. Additionally, a rise in the number of medications prescribed by doctors, particularly those with limited therapeutic ranges or linked to frequent adverse drug reactions, should be avoided if at all possible and used under close supervision.

In the same line with Paul, Sobhan Gupta & Mian, (2023) in their study entitled with evaluating the effectiveness of interventions to reduce medication errors and mentioned that mistakes happen when doctors don't know what the medications, they are prescribing are, how they interact with them, or what side effects to watch out for. New hires and inexperienced doctors are more vulnerable to pharmaceutical mistakes.

Regarding organization factors related to medication administration error finding of the present study reveals that reduced availability of resources such as medicine trays and carts that are the most common cause of medication errors related to organization, followed by insufficient number of hiring professional nurses, factors related to pharmacy, medication not available, there are no rules for administering drugs in the facility. and poor communication between pharmacists and nurses.

These finding in the same line with Soori, (2024) who conducted study entitled with errors in medical procedures in medical science investigations and found that insufficient funding, restricted access to education and training, and a lack of supervision and control. Medication mistakes can also be caused by cultural differences and poor communication.

These finding in the same vein with Brabcova, et al., (2023) who conduct study entitled with reasons for medication administration errors, barriers to reporting them and the number of reported medication administration errors from the perspective of nurses and found that The most compelling arguments for MAEs are the similarities between medicine names and packaging. LASA (Look-A like Sound-A like) pharmaceuticals are those that are more likely to be confused because of their similar trade names or packaging. It was suggested that using electronic prescriptions through the hospital information system was an effective way to reduce MAEs.

As well as, Abd Elmageed, Soliman &Abdelhamed, (2020) showed that Prescription, transcribing, dispensing, administration, and monitoring procedures can all be affected by errors, which can lead to serious injury, disability, and even death. These errors can happen at any point in the medication use process and are caused by inadequate medication systems, unfavorable environmental conditions, or a lack of staff.

Conclusion

According to the research findings most of studied staff nurses had inadequate knowledge of medication administration safety practice and identify factor contributing error.

Recommendations:

The implementation of a medication safety training program for nurses improves their attitudes toward drug safety.

Creating a standardized system that enables error monitoring, reporting, analysis, and review in a supportive environment in order to pinpoint and eradicate mistake sources.

Clear and current evidence-based standards for drug administration and safety should be developed, and these guidelines should serve as the foundation for continuing in-service training and educational initiatives.

All medical professionals should receive training on all aspects of medication administration, including dosage calculations, medication administration and preparation, clinical indicators of hazardous drug responses, drug action and interactions, and the reasons behind and ways to avoid mistakes.

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