

## Nurses' Awareness Regarding Patients' Safety Receiving Vasoactive Medication in Critical Care Units

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### Abstract

**Background:** Critical care nurses are responsible for managing the preparation, timing of initiation, administration, titration, and weaning of vasoactive infusions based on the prescriptions of the physician so; to ensure patient safety, they must have adequate knowledge about medication, goals of drug therapy, and interventions to minimize adverse reactions. **Aim of the study:** This study was conducted to assess nurses' awareness regarding patients' safety receiving vasoactive medication in critical care units **Design:** A descriptive exploratory was utilized to achieve the aim. **Setting:** This study was conducted at two ICUs as follows (Cardiovascular Care Unit, and Chest Care Unit) affiliated with Ain Shams University Hospital. **Sample:** A convince sample (50) of all available nurses working in critical care units as mentioned previously. **Tools:** Data was collected using three tools 1) Nurses' Knowledge Interview Questionnaire.2) Nurses' level of Practice Observational Checklist.3) Nurses' Awareness of Medication Safety Scale. **Results:** The majority of the studied nurses had an unsatisfactory level of total knowledge and about a fifth had an incompetent level of practice. Meanwhile, most of the studied nurses had an unsafe level regarding patients' medication safety receiving vasoactive medication in critical care units. **Conclusion:** There was a statistically significant correlation between the total studied nurses' knowledge, practice, and their total patients' medication safety receiving vasoactive medication in critical care units. **Recommendations:** Provide educational and training programs to improve nurses' awareness regarding patients' medication safety receiving vasoactive medication in critical care units supported with evidence-based practices and guidelines.

**Keywords:** Nurses' Awareness, Patients' Safety, Vasoactive Medication.

### Introduction

Critical care nurses must monitor and treat life-threatening changes that occur in patients. Therefore, the focus is usually on maintaining the stability of a patient's physiologic function through a variety of technologies and treatments. In addition to must have a skill for delivering high-quality care to each patient, as well as incorporating psychosocial and holistic approaches to care that are appropriate to the patient's status, in addition to more recent opportunities that working within a Tele-ICU setting (Urden, et al., 2019).

For that reason, the modern nurse must be knowledgeable, because of being highly

vigilant and using cognitive abilities and intelligence to go beyond tasks and gather multiple data to make rapid decisions regarding subtle or deteriorating conditions. Moreover, their primary role is to provide direct care to patients besides roles that nurses play in providing care to critically ill patients such as responsibilities to interact with patients, families, and the healthcare team. Depending on the need of patients and the resources of each organization, expanded-role nursing positions may take different forms (American Association of Critical-Care Nurses, 2020).

It has been shown that vasoactive medication including vasopressor and inotropic usually has a short half-life and is rapidly metabolized after administration, is

administered infusion continuously, and is titrated for maximum effect. Accordingly, these drugs are pharmacokinetically equal, pharmacokinetic factors are rarely relevant, also inotropic or vasopressors have specific pharmacodynamics profiles depending on the relative mechanisms of their receptors and mechanisms of action. The process of administering vasoactive drugs involves giving the patient the active substance, typically by an intravenous infusion (Hemmings, & Egan, 2019).

According to National Health Service (2022) defines patient safety as the prevention of unintentional or unwanted harm to a patient during healthcare. So, healthcare providers need to support reducing patient safety incidents and improving the quality of care. Patients should be treated in a safe environment and protected from preventable harm. Healthcare quality is generally viewed as being centered on patient safety. In other words, patient safety is about preventing errors, injuries, accidents, and infections from occurring at hospitals and other healthcare facilities. Both academic research and quality improvement continue to focus on patient safety.

Over time, medication misadventures occur more often, such as medication errors, adverse drug reactions, and adverse drug events. The term "adverse drug events" refers to the adverse effects of medications, including allergic reactions, side effects, overmedication, and medication errors, and a significant health concern across the nation. These events result in inefficient or inappropriate use of the medication or harmful outcomes when a patient is in control of the medication. While can be avoided adverse drug reactions that are expected undesirable effects which are part of the pharmacologic activity of the drug (Hughes & Blegen, 2022). On the other hand, some of the most common causes of medication errors are workloads, similar drug names, interruptions, a lack of support staff, insufficient time to counsel patients, and illegible handwriting (Tariq et al., 2022).

### **Significance of the study:**

Patients' safety has received major attention in recent years, aiming to provide the best possible care and minimize the risk of harm. One way to improve patient care is the standardization of procedures and actions in administering vasoactive medication (Paim, et al., 2017). Nurses should strictly follow all instructions, procedures, and policies during administering vasoactive medication (Lappalainen, et al., 2019). So, it's a critical issue to assess nurses' awareness regarding patients' safety receiving vasoactive medication in critical care units.

### **Aim of the study:**

This study was conducted to fulfill the following aims: assess nurses' awareness regarding patients' safety receiving vasoactive medication in critical care units through the following:

1. Assess nurses' level of knowledge regarding patients' safety receiving vasoactive medication in the critical care units.
2. Assess nurses' level of practice regarding patients' safety receiving vasoactive medication in the critical care units.
3. Assess nurses' awareness regarding applications of patients' medication safety scale in the critical care units.

### **Research Questions:**

1. What is the nurses' level of knowledge regarding patients' safety receiving vasoactive medication in the critical care units?
2. What is the nurses' level of practice regarding patients' safety receiving vasoactive medication in the critical care units?
3. There is a relation between nurses' knowledge and awareness regarding application of medication safety scale in critical care units?

### **Operational definition:**

The nurses' awareness in the current study refers to nurses' knowledge and practice regarding patients' medication safety.

## Subject and Methods

### Research Design:

A descriptive exploratory study was utilized in this study to achieve the aim.

### Setting:

The study was conducted at two ICUs as follows (Cardiovascular Care Unit, and Chest Care Unit) affiliated with Ain Shams University Hospital.

### Subject:

A convenience sample (50) of all available nurses working in critical care units (30) of them in the Cardiovascular Care Unit and a residual number (20) in the Chest Care Unit.

### Tools for data collection:

#### Tool (I): Nurses' Knowledge Interview Questionnaire.

It was designed after reviewing recent literature by the researcher in simple Arabic language, it consisted of two parts:

**Part I:** This part was concerned with assessing demographic data, which includes: nurses' age, gender, level of qualification, years of experience, and attending courses about vasoactive medication.

**Part II:** It was concerned with assessing nurses' level of knowledge regarding patients' safety receiving vasoactive medication in critical care units. Nurses' knowledge regarding general pharmacological concepts of vasoactive medication. It will include (action, indication, side effects, complications..., etc.). It adapted from (Burchum, et al., 2019; Hemmings, & Egan, 2019). It included General knowledge about medication administration., Specific knowledge about vasoactive medication administration and nursing care, and Patients' medication safety knowledge about vasoactive medication eight subtitles in the form of 50 MCQ questions as follows:

- General pharmacological concepts include (eight questions).
- Nurses' knowledge about epinephrine medication includes (six questions).
- Nurses' knowledge about norepinephrine medication includes (five questions).
- Nurses' knowledge about dobutamine medication includes (five questions).
- Nurses' knowledge about dopamine medication includes (four questions).
- Nurses' knowledge about phenylephrine medication includes (four questions).
- Nurses' knowledge about vasopressin medication includes (four questions).
- Nurses' knowledge about milrinone medication includes (four questions).
- Nurses' knowledge of patients' medication safety includes (ten questions).

### Scoring system:

The total score of nurses' knowledge was calculated to be 50 questions. The respondent will give one point for each correct answer and zero for incorrect answers. A total score of  $\geq 80\%$  ( $\geq 40$  scores) was considered satisfactory, while  $< 80\%$  ( $< 40$  scores) was considered unsatisfactory.

#### Tool (II): Nurses' Level of Practice Checklist.

It was designed by the researcher in the English language and adapted after reviewing recent literature (Lynn, 2019; Smith & Pacitti, 2020). This tool is used to assess nurses' level of practice regarding patients' safety receiving vasoactive medication in critical care units. It includes four subtitles:

- Preparation phase includes (18 steps).
- Administrating phase includes (15 steps).
- Post-administrating phase and include (four steps).
- Consideration points according to the used medication and it includes (five steps).

**Scoring system:**

The total score of nursing practice was calculated to be 42 steps. Each step will be done or not done. one score for step done and zero for that not done. A total score of  $\geq 90\%$  ( $\geq 54$  scores) was considered competent, while  $< 90\%$  ( $< 54$  scores) was considered incompetent.

**Tool (III): Nurses' Awareness of Medication Safety Scale.**

This tool was modified by the researcher in the English language. It was adapted from (Clinical Excellence Commission., 2015; Institute for Safe Medication Practices., 2015) to assess patients' safety receiving vasoactive medication in critical care units and it consisted of ten subtitles with 62 statements:

- Patient information (eight statements).
- Drug information (five statements).
- Communication of drug orders and other drug information evaluation (four statements).
- Drug labeling, packing, and nomenclature (eight statements).
- Drug standardization, storage, and distribution evaluation (seven statements).
- Medication delivery device acquisition, use, and monitoring (seven statements).
- Environmental factors (four statements).
- Staff competency and education (nine statements).
- Patient education (four statements).
- Quality process and risk management (six statements).

**Scoring system:**

Likert Type Rating Scale: It was adapted (Clinical Excellence Commission.,2015; Institute for Safe Medication Practices., 2015), and it was modified by the researcher into three Likert scales (Never, Sometimes, and Always). As regards the Likert Type Rating Scale, scores of 1, 2, and 3 were respectively given to the responses: Never, Sometimes, and Always. The total score on the scale was 62, and a total score  $\geq 90\%$  ( $\geq 176$  scores) was considered safe,

while below  $< 90\%$  ( $< 176$  scores) was considered unsafe.

**Validity and reliability:**

Validity of the suggested tools was done through a jury of seven experts. They were one professor, two assistant professors, and four lecturers from the critical care and emergency department and medical-surgical nursing department. They reviewed the tools for clarity, relevancy, comprehensiveness, understanding, and easiness of administration. Monitoring modifications were required.

Reliability was tested statistically for the developed tools using Cronbach's coefficient alpha statistical test for the internal consistency of the tool items. The data were analyzed for knowledge (0.805), practice (0.825), and patients' medication safety (0.764).

**Ethical Consideration:**

The researcher clarified the objectives and aims of the study to the nurses included in the study. Protected nurses' rights in the study before answering the self-administered questionnaire, oral consent was taken from each nurse after being aware of the nature, objective, and benefits of the study. The nurses were aware that sharing is willing and could withdraw from the study without giving reasons. Confidentiality was assured by declaring that personal information was protected private after being shared with the investigator only and assured nurses that the information would be utilized only for research purposes. The date of the ethical committee was 23/3/2022.

**Administrative design:**

Official permission was obtained from the scientific research ethical committee from the Faculty of Nursing at Ain Shams University to the director of the setting in Ain Shams Hospital in which the study was conducted, explained the purpose of the study to obtain their permission to conduct this study.

**Pilot study:**

A pilot study was carried out on 10 nurses from the sample size to test the applicability, clarity, and efficiency of tools, and appreciate the time needed to collect data parallel to detect any possible obstacles that might face the researcher and interfere with data collection. The nurses who participated in the pilot study were included in the final analysis of the sample, and there is no modification in tools.

**Fieldwork:**

The current study was carried out (about 3 months) from October 2022 to January 2023, the researcher was visiting the cardiac care unit and chest intensive care unit in the morning and afternoon shifts 3 days per week (Tuesday, Wednesday, and Thursday). The current study was carried out through three phases as follows:

**First phase:** The researcher interviewed the nurses and explained the aim of the study. They were assured that the information collected would be treated confidentially and would be used only for research. Only code numbers were used, and no names appeared. In addition, the researcher filled in the practice checklist in the morning and afternoon shifts during actual nurses' work. The practice checklist was completed by the researcher, and it was taken for 10-15 minutes for every nurse.

**Second phase:** The researcher asked each nurse individually about opinions regarding patients' medication safety through an assessment tool and it was taken for 30 minutes for every nurse.

**Third Phase:** The knowledge interview questionnaire was distributed to all respondents' nurses and the researcher was offered clarification, whenever confusing questions it was taken for 40 minutes for every nurse.

**Statistical design:**

Data collected from the studied sample was revised, coded, and entered using a personal computer (PC). Fulfilled using (SPSS) version 21. Data were presented using descriptive statistics in the form of frequencies,

percentages, and mean SD. The Chi-square test statistic is commonly used for testing the relation between categorical variables. The correlation coefficient @ test was used to test the relation between two quantitative variables.

**Significance of the results:**

Non-significance with a p-value  $\geq 0.05$

Statistical significance with a p-value  $< 0.05$

High significance with a p-value  $< 0.01$

**Results:**

Concerning demographic data of the study, **Table 1** showed that 68 % of the studied nurses their aged from 20 to less than 30 years with a mean of  $28.5 \pm 7.53$  years. Regarding gender, 56% of them were female. Concerning the level of qualifications, 44% of them had nursing institutes. Also, 54% of years of experience were less than 1 year, with a mean of  $3.6 \pm 4.16$  years. Moreover, 84% didn't attend courses about vasoactive medication.

**Table 2** results showed that there was a statistically insignificant difference between correct and incorrect of the studied nurses' general knowledge and patients' medication safety at  $P > 0.05$ . While there was a highly statistically significant difference between correct and incorrect of the studied nurses' specific knowledge about vasoactive medication administration and nursing care at  $P \leq 0.001$ .

**Figure (1)** showed that 78% of the studied nurses had a competent level of practice regarding administered of vasoactive medication. While 22% of them had an incompetent level of practice regarding administered vasoactive medication.

**Table 3** showed that 100% of the studied nurses had always responded regarding drug standardization, storage, and distribution evaluation. 80% of the studied nurses have always responded regarding patient information and environmental factors respectively. 50% of the studied nurses have always responded regarding communication of drug orders and other drug information evaluation and staff competency and education respectively. While 82% of the studied nurses have sometimes responded regarding patient education and

finally 20% of the studied nurses have never responded regarding environmental factors.

**Figure (2)** showed that 22% of the studied nurses' aware regarding application of medication safety scale in the critical care units. While 78% of the studied nurses not aware regarding applications of medication safety scale in the critical care units.

**Table 4** illustrated a correlation between the total studied nurses' knowledge regarding vasoactive medication and their total nurses' awareness of medication safety in critical care

units, which was statistically significant ( $r$  test = 0.269 at  $P \leq 0.05$ ). Meanwhile, this table showed that there was a negative correlation between the total nurses' practice regarding administered vasoactive medication and their total nurses' awareness of medication safety in critical care units, which was statistically significant ( $r$  test = -0.301 at  $P \leq 0.05$ ). Moreover, no correlation between total nurses' knowledge regarding vasoactive medication and total nurses' practice regarding administered vasoactive medication, which was statistically insignificant ( $r$  test = 0.076 at  $P > 0.05$ ).

**Table (1).** Frequency and percentage distribution of the studied nurses' demographic data (n=50).

Data	N	%
<b>Age (year)</b>		
From 20 to less than 30 years.	34	68
From 30 to less than 40 years.	9	18
Above 40 years or more.	7	14
<b>Mean <math>\pm</math> S.D</b>	28.5 $\pm$ 7.53	
<b>Gender</b>		
Female	28	56
Male	22	44
<b>Level of Qualifications</b>		
Nursing diploma.	10	20
Nursing institute.	22	44
Nursing bachelor.	18	36
<b>Years of Experience</b>		
Less than 1 year.	27	54
From 1 to 5 years.	8	16
More than 5 years.	15	30
<b>Mean <math>\pm</math> S.D</b>	3.6 $\pm$ 4.16	
<b>Attend courses about vasoactive medication</b>		
Yes	8	16
No	42	84

**Table (2).** Relation between total nurses' level of knowledge and its categories (n= 50).

Variables	Total Nurses' level of knowledge				X <sup>2</sup>	P-value
	Correct		Incorrect			
	N	%	N	%		
General knowledge about medication administration.	27	54	23	46	1.198	0.2749
Specific knowledge about vasoactive medication administration and nursing care.	1	2	49	98	50.00	0.001**
Nurses' knowledge about patients' medication safety.	15	30	35	70	0.437	0.508

> 0.05 insignificant \*\* $\leq$  0.001 highly significant

Figure (1). The total competent and incompetent level of studied nurses' practice regarding receiving vasoactive medication in critical care units (n=50).

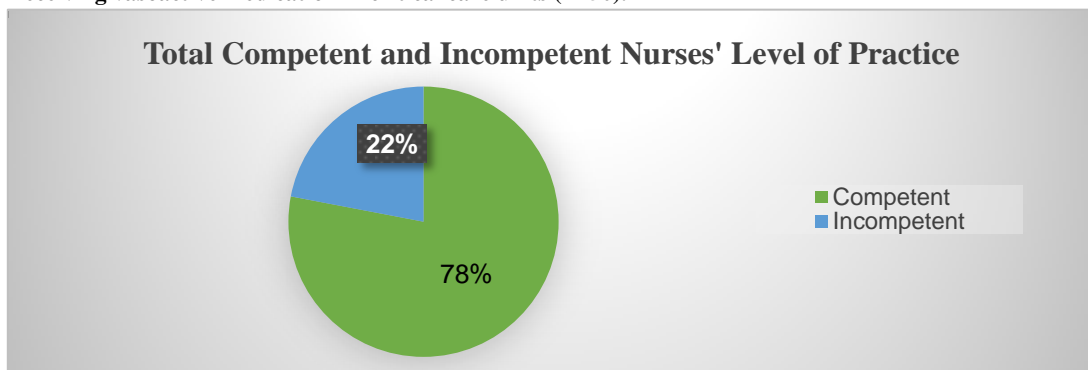
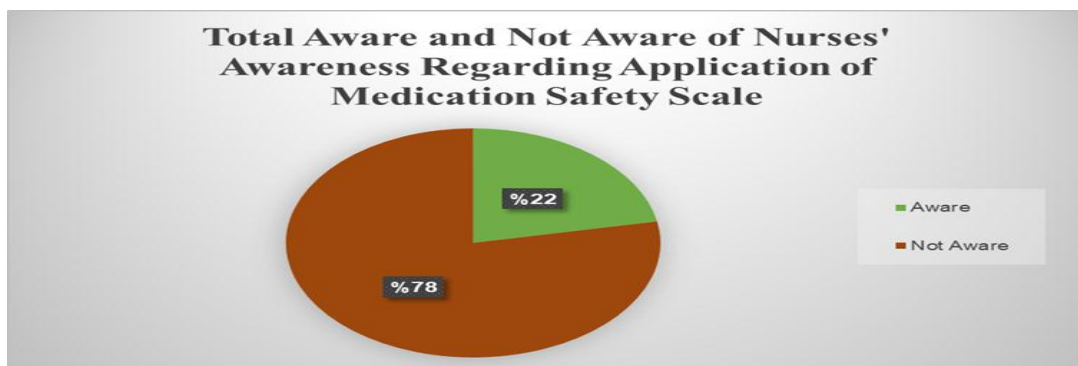


Table (3). Frequency and percentage distribution of the nurses' awareness regarding the application of medication safety scale (n= 50).

Total nurses' awareness regarding the application of medication safety scale	Always		Sometime		Never	
	N	%	N	%	N	%
Patient information	40	80	8	16	1	2
Drug information	38	76	5	10	7	14
Communication of drug orders and other drug information evaluation	25	50	25	50	0	0
Drug labeling, packing, and nomenclature	49	98	1	2	0	0
Drug standardization, storage, and distribution evaluation	50	100	0	0	0	0
Regarding medication delivery device acquisition, use, and monitoring	30	60	20	40	0	0
Environmental factors	40	80	0	0	10	20
Staff competency and education	25	50	21	42	4	8
Patient education	9	18	41	82	0	0
The quality process and risk management	19	38	31	62	0	0

Figure (2). The total aware and not aware of the studied nurses' awareness regarding application of medication safety scale in the critical care units (n=50).



**Table (4). Correlation between total nurses' knowledge, total nurses' practice, and total patients' medication safety regarding vasoactive medication in critical care units.**

Item	r test	P value
Total nurses' knowledge and total nurses' practice.	0.076	0.60
Total nurses' knowledge and total patients' medication safety.	0.269	0.05*
Total nurses' practice and total patients' medication safety.	-0.301	0.03*

\* $\leq 0.05$  significant**Discussion:**

Regarding the **demographic data** of the studied nurses, the study demonstrated that more than two-thirds of the studied nurses were aged between 20 and less than 30 years old. This result was supported by (Ibrahim, et al., 2022) in the study entitled "Effect of Medication Safety Guidelines on Prevention of Medication Errors among Nurses in the Intensive Care Unit" which reported that more than fifty percent of the nurses working in the ICU among the age of 25 and less than 30. From the researcher's point of view, this age group has an opportunity to learn and gain more knowledge that enhances their skills.

As regards **gender** the current study results showed that more than half of the studied nurses were female. This result came in agreement with (Sabry, et al., 2020) in the study entitled "Nurses' Performance Regarding Care of Patients with Tracheostomy" which discussed that most of the study nurses were females. It may be since the establishment of the nursing field only females worked in it.

Concerning the **level of qualification**, the current study results showed that two-fifths of the studied nurses have a nursing institute certificate. According to (Central Agency for Public Mobilization and Statistics in Egypt, 2022) the number of technical nursing institutes graduates reached 5151 in 2020 compared to 4415 graduates in 2019, an increase of 16.7% in Egypt which is mean the number of this educational category increased yearly, in addition, to increase the chance to recruit in the government hospital. The researcher's opinion of view, the educational level is an important point that affects patients' safety, especially in the ICU.

The result of the current study regarding **years of experience** more than half the studied nurses have less than 1 year. These results disagreed with those (Lalujan, & Musharyanti, 2021) in the study entitled "Factors Affecting the Role of Nurses in Medication Safety: A Literature Review" showed that Medication errors could be affected by the nursing profession's experience especially those with fewer than 10 years of work experience. From the researcher's perspective, years of experience is an essential issue for intensive care unit nurses due to critical areas that need more experience can deal with patients and manage critical situations.

Most of the studied nurses do not **attend training courses** about vasoactive medication and this effect their knowledge and practice regarding the administration of vasoactive medication. These results agreed with (Al-Zaru, et al., 2022) In the study entitled "Effectiveness of An Educational Program Regarding Vasoactive Drugs at The Level of Knowledge and Practices Among Nurses Working in Critical Care Units" which concluded the implemented teaching program considerably enhanced the critical care nurses' knowledge and practical skills regarding managing the administration of vasoactive medications. In the researcher's opinion, training courses must be applied in a frequent manner for all nursing staff, especially ICU nurses to always update their knowledge.

The current study assessed nurses' **level of knowledge** regarding patients' safety receiving vasoactive medication in the critical care units most of the studied nurses had incorrect knowledge. This result concurs with (Bakr, et al., 2019) in the study entitled "Nurses' Performance Regarding Administration of Inotropic Medications for



Critically Ill Patients” which concluded the majority of nurses have inadequate knowledge.

In addition to supporting the study result (Qedan, et al., 2022) in the study entitled “Nurses’ Knowledge and Understanding of Obstacles Encountered Them When Administering Resuscitation Medications: A Cross-Sectional Study from Palestine” showed that nurses are inadequately knowledgeable about lifesaving drugs.

On the other hand, the current study results were disagreed (Giannetta, et al., 2021) in the study entitled “Comparison Across 12 Countries on Knowledge, Attitude, and Behavior Scores about Medication Errors in Intensive Care Units: An International Study” which discussed the study illustrates that younger or less experienced nurses are more likely to have a level of sufficient information than older or more experienced nurses. From the researcher’s point of view, this result is due to the majority of studied nurses didn’t attend training courses, and related to their workload they didn’t have time to update their knowledge.

The current study assessed nurses’ **level of practice** regarding patients’ safety receiving vasoactive medication in the critical care units, less than a quartile of the studied nurses have incompetent level of practice. This result agreed with (Fathy, et al., 2020) in the study entitled “Nurse’s Knowledge Practice Regarding Medication Errors in Critical Care Units: Descriptive Study” which showed Just over one-third of them performed completely effectively when administering drugs.

On the other hand, this result has interfered with (Allawy, et al., 2020) in the study entitled “Effect of Implementing Guidelines Regarding Administering Inotropic Medications for Critically Ill Patients on Nurses’ Practice” which discussed the majority of the nurses who participated in the study had unacceptable procedures for giving inotropic.

Moreover, this result was inconsistent with (Mostafa, et al., 2020) in the study entitled “Knowledge, Attitude, and Practice of Nurses in Administering

Medications at Mansoura University Hospitals” presents showed somewhat more than three-quarters of the nurses reported having poor practice scores for administering drugs, and that more than three-quarters of the nurses had poor practice evaluations for preparing drugs. Additionally, slightly under twenty-five percent of the nurses have unsatisfactory post-medication practice. but not least, most nurses have insufficient overall practice scores.

Furthermore, the current study was contradicted by (Elsayed, et al., 2022) in the study entitled “Assessment of Nurses’ Knowledge and Practice regarding Antiarrhythmic Medication at Critical Care Units” which illustrated showed the overall practice score of many nurses have unsatisfactory. From the researcher’s point of view, overall nurses have more practical skills than knowledge because they apply procedures daily as a routine of work.

The current study assessed **nurses’ awareness regarding applications of medication safety scale in the critical care units**. Most-studied nurses had an unsafe level of patients’ medication safety. This result agreed with (Abu Hussein, et al., 2022) in the study entitled “Effect of Patient Safety Program for Nurses on Medication Administration” which showed that All of the staff nurses had insufficient levels of patient safety knowledge, which also indicated that most staff nurses had poor patient safety competencies.

On the other hand, the current study disagreed with (Hadad, et al., 2021) in the study entitled “Perceptions of Staff Nurses about Patient Safety Culture at Minia General Hospital” which concluded that more than half of staff nurses scored highly on patient safety culture. From the researcher’s point of view, this result is due to most nurses being loaded with duties. Also, the nurse-to-patient ratio didn’t apply correctly.

In addition, the current study illustrated a correlation between the total studied nurses’ knowledge and their total patients’ safety, which was statistically significant ( $P < 0.05$ ). this result agreed with (Abu Hussein, et al., 2022) in the study entitled

“Effect of Patient Safety Program for Nurses on Medication Administration” which showed that significance was found between patient safety attitude and medication administration knowledge. The researcher’s opinion when nurses have the knowledge, they prevent errors and enhance patients’ safety.

Finally, in the current study result, there was a negative correlation between the total nurses’ practice medication and their total patients’ medication safety receiving vasoactive medication in critical care units, which was statistically significant ( $P = < 0.05$ ). This result is through with (Ahmed, et al., 2022) in the study entitled “Nurses’ Knowledge and Practice Regarding Patients’ Safety Goals in Intensive Care Units” which concluded that there was a positive correlation between total nurses’ knowledge and their total practice regarding patient safety goals in the intensive care units. From the researcher’s point of view when nurses practice being more competent and accurate, they improve patients’ safety and avoid hazards.

### Conclusion:

Based on the findings of the current study, it can be concluded that the majority of the studied nurses had an unsatisfactory level of total knowledge and about a fifth had an incompetent level of practice regarding vasoactive medication. While most of the studied nurses had an unsafe level regarding patients’ medication safety receiving vasoactive medication in critical care units.

Also, there was a highly statistically significant relation between total knowledge regarding vasoactive medication and the years of experience of the studied nurses. In addition, there was a statistically significant correlation between the total studied nurses’ knowledge regarding vasoactive medication and their total patients’ medication safety receiving vasoactive medication in critical care units, and there was a correlation between the total nurses’ practice regarding administered vasoactive medication and their total patients’ medication safety receiving vasoactive medication in critical care units.

### Recommendation

Based on the result of this study, the investigator recommended that:

- The study should be reapplied to a large sample and in a different hospital setting to generalize the results.
- Nurse supervisors should also monitor nurses’ practice in relation to the administration of vasoactive medication to ensure the application of patients’ medication safety.
- Developing a simplified and comprehensive booklet including basic information about vasoactive medication in the critical care units.
- Provide educational and training programs to improve nurses’ awareness regarding patients’ medication safety receiving vasoactive medication in critical care units supported with evidence-based practices and guidelines.

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