International Journal of Multiphysics
Volume 18, No. 3, 2024
ISSN: 1750-9548

Factors Affecting Nurses' Performance Regarding Invasive Procedures in Intensive Care Unit

Shereen Mohamed Hamdy Metwally [(1)], Nadia Mohamed Taha [(2)], Maha Desoky Saleh Sakr[(3)] and Fatma Mohamed Abdelhamid [(4)]

[(1)] B.Sc. Nursing, Zagazig University, Egypt. [(2)] Professor of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt. [(3)] Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt. [(4)]Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Zagazig University, Egypt.

Abstract

Background: Invasive procedure is defined as a medical procedure in which body is penetrated by tube or needle. Nurses play critical role in care patients undergo invasive procedures. **Aim of the study:** this study aimed to evaluate factors affecting nurses' performance regarding invasive procedures in intensive care unit. **Subjects and Methods: Research design:** Descriptive design. **Setting:** The study was conducted in paid ICU and general ICU of internal medicine hospital at Zagazig University Hospital. **Subject:** Convenience sample of all available nurses, that are 60 nurses. **Tool of data collection:** Two tools were used **Tool I:** An Interview Questionnaire to assess socio-demographic data, knowledge of nurses and Factors affecting nurses' performance, **Tool II:** observational checklist to assess nurses' practices regarding invasive procedures. **Results:** The results revealed that 56.7% and 58.3% of the studied nurses had unsatisfactory total knowledge and practice respectively regarding invasive procedures, as well as 85.0% of the studied nurses reported that their performance was affected by nurse, patient, and work-related factors. Also, the results revealed that there was statistically significant relation between the studied nurse's total knowledge and total practices. **Conclusion:** This study concluded that near to three fifths of studied nurses have unsatisfactory total knowledge and practice level regarding invasive procedures. Also, the majority of studied nurses reported that their performance regarding invasive procedures was influenced by nurses, patients, and work-related factors. **Recommendations:** Established training program for nurses to improve nurses' knowledge and practice regarding invasive procedures.

Key words: Factors, Intensive care unit, Invasive procedures, Nurses' Performance.

Introduction:

Procedures can be divided into two categories-invasive procedures and non- invasive procedures. An invasive procedure is defined as a medical procedure which breaks the skin in some way or a procedure in which body is penetrated or entered by a tube or a needle. Non-invasive procedures are also quite common, these are defined as any medical procedure which does not break the skin **(Gheshlaghi et al., 2021)**.

An invasive procedure is one where purposeful access to the body is gained via an incision, percutaneous puncture, where instrumentation is used in addition to puncture needle, or instrumentation via a natural orifice for diagnostic and therapeutic purposes. Invasive procedures contribute to diagnoses in several ways: by directly observing affected area, by revealing the characteristic tissue histology and by obtaining cultures from clinical samples. Critically ill patient in intensive care units often need different types of invasive procedures, whether diagnostic or therapeutic. these procedures often become necessary for diagnosis, treatment, and monitoring **(Fernández et al., 2022).**

The commonly used invasive procedures in intensive care units include central venous catheter, peripheral intravenous cannula, urinary catheter, nasogastric tube, arterial blood gases and suctioning procedure. In medical terms, many different procedures can be classified as invasive. This could range from a minor procedure like an injection or an endoscopy, right through to major surgical operations. Regardless of the scale, each of these procedures has one thing in common they penetrate protective barriers of the body **(Shibuya et al., 2024).**

Risks and complications of invasive procedures are the same as for any other surgical operation and include; Bleeding, infection, adhesions, internal organ injury, blood vessel injury, vein or lung blood clotting, breathing problems and death. Medical procedures have potential to cause complications. This is particularly so where medical device is inserted into body-either through skin into blood stream or a body cavity, or into gastrointestinal tract. Complications may arise at the time of insertion, or may develop after device has been in place for some time **(Mayez, Abd El Atty & Mohamed, 2022).**

All invasive procedures are associated with increased risk for infection as any invasive device that enters the body provides a portal of entry for microorganisms, thus increasing chance for infection. Thus, it has been reported that 50% of hospitalized patients inserting IV cannula get nosocomial infections. Also, 15-25% of all hospitalized patients with urinary catheter acquire urinary tract infections. Therefore, all invasive procedures must be performed with aseptic techniques. Moreover, nurses require knowledge and skills to practice such procedures safely in their areas and improve service delivery for benefit of their patients **(Paiva et al., 2021).**

The role of a nurse in an invasive procedure is to ensure the patient remains safe, comfortable, and medically stable. Nurse should: Ensure the correct procedure is being performed on correct body part on the correct patient , preparing patient for procedure, providing care and observation during the procedure, giving post-procedural care, monitoring vital signs, assessing the insertion site for signs of infection ,you may be responsible for positioning the patient correctly, providing emotional support, ensuring informed consent has been obtained **(Maya, 2022).**

Nurses are becoming increasingly responsible for care of patients after invasive procedures and its complications. Knowledge and uses of evidence-based practice are essential to ensure best practice and patients out comes. Nurses are the health care team members who have direct responsibility to care of patients under any invasive procedure **(AbdElbaky, Mohamed & Nagib, 2018, pp. 13-20).** On the other hand, low level of knowledge and practice of the CCNs in ICUs leads to increased rates of nosocomial infection to be more than 70% with increased mortality rates **(Sheta & Tantaewy, 2022)**.

There are many factors affecting nurses' performance include nurses' related factors such as (physical, psychological , socioeconomic , and occupational factors), health setting related factors such as (the relationship with colleagues, relationship with health service providers, appropriate appreciation from others, work organizing, and work environment) and patient related factors such as (patient's age, gender, difficulty health states, psychological states, ability to communicate, mobility, not following instructions, communication with the patient's family, and privacy and confidentiality of information) So that it is important to identify factors influencing the performance of nurses regarding to invasive procedures in intensive care unit **(Abd rabo, Taha & Moghazy, 2024)**.

Significance of the study:

Invasive procedures must be performed with aseptic techniques. unsafe practice of nurses is a worldwide problem. During clinical observation, it was found that complications associated with invasive procedures may occur in up to 40% of critically ill patients which can result in increased morbidity, prolonged hospitalization, and in some cases mortality. It has been shown that nurses do not have adequate knowledge and perform invasive procedures in ICUs based on traditional methods which mainly are not safe **(Shibuya et al., 2024)**.

The performance of nurses is influenced by a variety of factors, including patient, nurse and work-related factors. Therefore, addressing the issues that have a detrimental impact on nurses' performance **(Moghazy et al., 2024)**. Therefore, this study will be carried out to evaluate factors affecting nurses' performance regarding invasive procedures in ICU.

Aim of the study:

was to evaluate factors nurses' performance regarding invasive procedures in intensive care unit.

Research Questions:

- What is the level of nurse's knowledge regarding invasive procedures in ICU?
- What is the level of nurses' practice regarding invasive procedures in ICU?
- What are factors affecting on nurses' performance regarding invasive procedures in ICU?

Subjects and Methods

Study Design :

A descriptive research design was utilized.

Setting :

The current study was conducted in two intensive care units (Paid ICU and general ICU). Paid ICU and internal medicine hospital at Zagazig university Hospital.

Subjects :

The study sample was a convenience sample which includes all available nurses (60) working in the above mentioned setting (40 nurses in Paid ICU and 20 nurses in general ICU of internal medicine hospital) Zagazig university, Egypt.

Tools of data collection :

Data of this study was collected by researcher using two tools as the following:

Tool I: An interviewing questionnaire (Appendix I) :

It was designed in simple clear Arabic language to avoid misunderstanding. It was designed by researcher after reviewing of related literature references and opinions of experts for content of validity **(AbdElbaky, et al., 2018, Gardner & Wallace, 2021, Bayomi & Taha, 2022, Mayez, et al., 2022)**. It consists of 86 questions and composed of two parts as the following:

Part I: Demographic characteristics of the studied nurses: this part included data about demographic characteristics of the study subjects which consisting of seven close-ended questions such as (age, sex, marital status, qualification, years of experience in nursing field, years of experience in ICU, attendance of previous training courses.

Part II: Nurses' knowledge assessment: It was used to assess nurses' knowledge regarding invasive procedures: This consists of 79 questions in the form of (MCQ) and classified under seven main sections:

First section: it included eight questions about nurses' knowledge regarding invasive procedures such as definition, indication, types, complication and role of nurse.

Second section: it included 10 questions about nurses' knowledge regarding central venous catheter such as definition, indication, insertion site, position of the patient, complication and role of nurse.

Third section: it included 12 questions about nurses' knowledge regarding peripheral intravenous cannula such as definition, indication, insertion site, contraindication, complication and role of nurse.

Fourth section: it included 11 questions about nurses' knowledge regarding nasogastric tube such as definition, indication, contraindication, complication and role of nurse.

Fifth section: it included 13 questions about nurses' knowledge regarding arterial blood gases sample such as definition, indication, site of Abg, contraindication, complication and role of nurse.

Sixth section: it included 11 questions about nurses' knowledge regarding urinary catheter such as definition, indication, contraindication, complication and role of nurse.

Seven section: it included of 14 questions about nurses' knowledge regarding suction from nasal and oral cavity and from endotracheal tube: such as definition, indication, complication, role of nurse.

The scoring system

Total score for knowledge was 79 grades (100%). Each complete correct answer scored one grade, zero for incorrect answer. For each area of knowledge, score of items was summed- up and total divided by number of items, giving a mean score for part. Scores were converted into percent scores. Knowledge was considered satisfactory if percent score was equal or above 75% and unsatisfactory if less than 75% based on statistical analysis.

Part III: Factors affecting nurses' performance questionnaire:

This part was concerned with assessing factors affecting nurses' performance regarding invasive procedure in ICU. This part consisted of three points were factors related to nurse included 23 items, factors related to patient included 14 items and factors related to work environment included 39 items. Total items were 76 items. It was translated into Arabic language. It was adapted from **(Abd Elawhabe, et al., 2019 and Al-Shamaly, 2020)** and modified by researcher to suit aim of the study.

1-Factors related to nurse (23 items):

Includes four points as (physical factors include three items, psychological factors include six items, socioeconomic factors include three items, professional factors include 11 items).

2-Factors related to patient (14 items):

Covered age, sex, weight, religion, educational level, poor health state, psychological state, good communication between nursing and patient, communication with patients' family, ability to movement, instructions given to the patient and follow instructions.

3-Factors related to work environment (39 items):

Includes four points as (relation between nurses' college includes five items, relation between health care providers includes eight items, factors related to work organization includes eight items, factors related to hospital includes 18 items).

The scoring system:

Total score of factors was 76 grades (100%). Responds to statements were on two scales as follows: one point for affected, zero point for not affected. Total score for whole factors assessment tool was calculated in every nurse and mean of total score was calculated. These scores were converted into percentage scores. Nurses' role was affected with this factor when the total score equal or above 60% and not affected when the total score below 60% based on statistical analysis.

Tool II: Observation Check list: (Appendix II)

It was used to assess nurses' practice regarding invasive procedures. Attenuated observational check list was designed by researcher as guided by **(Perry, et al., 2021, Potter, et al., 2021, Mayez, et al.,2022, AACN, 2023, Cairo, 2023, Carter, et al.,2023, Cobbett, 2023, and Perry, et al.,2024).** It was contained 285 steps into eight standardized observational check list. which include: Caring of central venous catheter: which included 49 steps covering (Changing CVC dressing included 18 steps, Flushing of CVC included 20 steps, CVC cap changes included 11 steps), Insertion of peripheral intravenous cannula It included 27 steps, Nasogastric tube insertion It included 29 steps, Arterial blood gases sample It included 29 steps, Insertion of urinary catheterization in female It included 32 steps, Endotracheal tube suctioning It included 44 steps, Oropharyngeal suctioning It included 28 steps and Nasopharyngeal suctioning It included 47 steps.

The Scoring system:

Total score of practice was 285 grades (100%). Steps observed to be done were scored one and steps not done were scored zero for each area. Sore of steps were summed-up and total divided by number steps. Scores were converted into percentage scores. Nurses had a satisfactory level of practice when total score equal or above 80% and satisfactory if it below 80% based on statistical analysis.

Content validity and Reliability:

Content validity was conducted to determine whether content of tools cover aim of study. This stage developed by jury of five experts one professor, four assistant professor of medical surgical nursing who reviewed tool's content for clarity, relevance, comprehensiveness, applicability, understanding, and ease for implementation. All recommended modifications were done. Cronbach's Alpha that used to measure internal consistency.

Table Test of Reliability of Study Tools by Cronbach's Alpha

Reliability Statistics	Cornbrash's Alpha	No f Items
Knowledge	0.776	79
Practices	0.985	285
factors	0.946	76

Filed work:

Data collection phase of this study lasted for six months during period from beginning of December 2024 to end of May 2025. During this stage all data were collected from study subjects.

First phase of the work is preparatory phase done by meeting with head units for mentioned setting after obtaining official permissions, to clarify objective of study.

Second phase that done by meeting study subjects, each nurse was met individually, got a full explanation about aim of study and was invited to participate. Nurse who gave written and verbal informed consent to participate was handed self- administered questionnaire and was instructed during filling.

Data were collected two days a week (Sunday and Monday) in morning and afternoon shifts, time used for finishing self-administered questionnaire ranged between 20-30 minutes for each nurse according to nurses' physical and mental readiness, also researcher was observing nurses' practical skills about studied procedures. Time needed to complete checklist varies ranged between 30 to 45 minutes. Time needed to complete checklist depended upon time of the procedure and filled by researcher during nurses' performance inside department.

Pilot study:

A pilot study conducted on six nurses represented (10%) to check clarity, applicability, relevance, and feasibility of tools, to identify difficulties that may be faced during data collection. It also helped to estimate time needed to fill in sheets. Since no modification was done in tool, those who shared in pilot study were included in main study sample.

Administrative and Ethical consideration:

An official permission for data collection in Zagazig University Hospitals was obtained from hospital administrative personnel by submission of a formal letter from dean of faculty of nursing Zagazig university explaining aim of study in order to obtain permission and help.

Firstly, study proposal was approved by Research Ethics Committee (REC) and Postgraduate Committee of Faculty of Nursing at Zagazig University (M.D/Zu. Nu/R/246/11/8/2024). Then, interview, each nurse was informed about purpose, benefits of study, and they informed that their participation is voluntary and have right to withdraw from study at any time without given any reason. In addition, confidentiality, and anonymity of subjects were assured through coding of all data. Researcher assured that data collected will be confidential and would be used only to assess factor affecting nurses' performance regarding invasive procedures in ICU and to improve nurses' knowledge and practice for purpose of study.

Statistical analysis:

All data were collected, tabulated and statistically analyzed using IBM SPSS (Statistical Package for the social sciences) statistics for windows, version 2٥.0 IBM Corp., Armonk, NY: USA. Quantitative data were expressed as mean ± SD and (range), and qualitative data were expressed as absolute frequencies (number) and relative frequencies (percentage).

Percent of categorical variables were compared using Chi-square test, Pearson correlation coefficient was calculated to assess relationship between various study variables, (+) sign indicate direct correlation an (-) sign indicate inverse correlation, also values near to 1 indicate strong correlation and values near 0 indicate weak correlation. All tests were two sided. p- Value <0.05 was considered statistically significant (S), p-value> 0.05 was considered statistically insignificant (NS), P-value ≤0.01 Highly Significant (HS). β (regression coefficients) and R square test for Multiple linear regression.

Results:

Table 1: Clarifies that 83.3% of studied nurses equal and more than 25 years old, 60.0%, 65.0% of them respectively were female and married, 70.0 of them had bachelor degree in nursing sciences, 66.7% of them had experience in nursing less than five years in the nursing, 71.7% of them had experience less than five years in intensive care unit, 73.3% of them had training courses.

Table 2: Reveals that there are highly statistically significant relations between studied nurse's total knowledge and their education, with p- value was .000. Also, there was statistically significant relation between sex, nursing experience, ICU experience and training of studied nurses and their knowledge level except nurses age and marital status had no statistically significant relation with their knowledge level, with p- value were (.014, .003, .044 and .004) respectively.

Table 3: Reveals that there is statistically significant relation between nurses' practice regarding invasive procedures and their demographic characteristics except nurses' sex, marital status, nursing experience had no statistically significant relation with their practice level, p- value were (.029, .010, .011 and .030) respectively.

Table 4: Reveals that there is statistically significant correlations matrix between total nurses' knowledge and total practice level regarding invasive procedures with p- value was .029. Also, there was statistically significant correlations matrix between studied nurses' total practices and total factors affecting performance regarding invasive procedures in ICU with p- value was .004.

Figure (1): illustrates that 43.3% of the studied nurses had satisfactory level of total knowledge regarding invasive procedures, while 56.7% of studied nurses had unsatisfactory level of total knowledge score.

Figure (2): demonstrates that 85.0% of the studied nurses reported that their Performance related Invasive Procedures in Intensive Care unit was affected by total factors. While 15.0% of the studied nurses reported that their Performance related Invasive Procedures in Intensive Care unit was affected by total factors.

Figure (3): demonstrates that 58.3% of studied nurses had unsatisfactory practice level, while 41.7% of the studied nurses had satisfactory practice level**.**

Discussion:

The discussion will discuss the main results:

Part I: Concerned with demographic characteristics of studied nurses:

The current study clarified that majority of studied nurses equal and more than 25 years. This findings accordance with **(Moghazy et al., 2024)** who studied " Factors Affecting Nurses' Performance Regarding Prevention of Central Venous Line Associated Infection" stated that nearly two third of studied nurses more than 25 years old. In my opinion this result may be due to the age requirement for nurses performing invasive procedures can vary depending on regulations, hospital policies, and complexity of procedures.

As regard to gender and Marital status, current study results revealed that tree fifth of studied nurses were female and married. This finding was on the same line with **(Expósito et al., 2024)** reported that most of studied nurses were females. Also, its agreement with **(Gheshlaghi, et al., 2021)** stated that more than half of studied nurses were females and nearly two third of studied nurses were married.

Regarding to qualification of studied nurses, the result of present study showed that more than two third of studied nurses had bachelor degree in nursing sciences. This finding was in harmony with **(Kar and Kazan, 2021)** who studied " Evaluation of skills of intensive care nurses regarding central venous catheter care: An observational study" stated that more than two third of studied nurses were had a bachelor degree.

Concerning years of experience in nursing, study findings revealed that two thirds of studied nurses had experience in nursing less than five years. This result agreement with **(AbdElbaky, Mohamed & Nagib, 2018)** who studied " Impact of Simulated Education program on Nurses' Performance of Invasive Procedure at Intensive Care Units: Evidence Based Practice" stated that majority of studied nurses had experience less than five years.

Concerning years of experience in intensive care unit the study findings revealed that more than two thirds of studied nurses had experience less than five years in intensive care unit. This result agreement with **(Chen et al., 2021)** stated that nearly to half of studied nurses had experience less than five years in intensive care unit.

Regarding previous attendance of training courses about invasive procedures, findings reported that nearly three quarters of studied nurses had training courses about invasive procedures. This result was on the same line with **(Mayez, Abd El Atty & Mohamed, 2022)** who studied " Nurses Performance Regarding Invasive Procedures in Intensive Care Unit" stated that nearly two third of studied nurses had training courses about invasive procedures.

Part II: Concerned with total nurses' knowledge about invasive procedures:

The current study clarified that near to three fifth of studied nurses had unsatisfactory level of total knowledge regarding invasive procedures. This finding on same line with **(AbdElbaky, Mohamed & Nagib, 2018)** stated that the all of studied nurses had unsatisfactory knowledge about invasive procedures. This finding was disagreement with **(Mayez, Abd El Atty & Mohamed, 2022)** Stated that nearly two third of studied nurses had satisfactory knowledge about invasive procedures in ICU.

Part III: Concerned with total factors affecting nursing performance regarding invasive procedures in intensive care unit:

The current finding revealed that majority of studied nurses had reported that their Performance related Invasive Procedures in ICU was affected by nurse, patient and work-related factors. This result was in agreement with **(Said, Yassien &Ali Ameen, 2020)**. in a study entitled " Factors Affecting Nurses' Performance toward Central Line Associated Blood Stream Infection in Critical Care Units" mentioned that majority of studied nurses their performance was affected by nurse related factors, patient related factors, setting related factors.

Controversy with **Mohamed, Taha & Bayomi, 2021)** in a study about "Factors affecting nurses' role regarding care of patients with fluid and electrolyte balance undergoing urinary diversion" clarified that the majority of studied nurses their performance was not affected by the previous mentioned factors, environment and equipment and the pressures facing nursing staff.

Part IV: Concerned with total nurses' practice about invasive procedures:

The current study clarified that neat to three fifth of studied nurses had unsatisfactory level of total practice regarding invasive procedures. This finding on same line with **(Elbqry, 2024)** who studied " Nurses' Practice and Knowledge of Peripheral Intravenous Cannula Flushing Pre-Therapy Administration at Medical-Surgical Wards" stated that two third of studied nurses had unsatisfactory practice about invasive procedures. This finding disagreement with **(Mayez, Abd El Atty & Mohamed, 2022)** stated that more than half of studied nurses had satisfactory practice about invasive procedures in ICU.

Part V: Relation and correlation between The Study Variables:

Regarding to relation of demographic characteristics of studied nurses and their total knowledge regarding invasive procedures. The finding indicated that there highly statistically significant relations between the studied nurse's total knowledge and their education. Also, there was statistically significant relation between sex, nursing experience and training courses and their knowledge level except nurses age and marital status had no statistically significant relation with their knowledge level. Result supported with **(Moustafa et al., 2024)** stated that there was high significant relation between total knowledge level of nursing and their years of experience and education, without significant relation between knowledge level and age.

Considering relation of demographic characteristics of studied nurse and total practice level regarding invasive procedures. There was statistically significant relation between nurses' practice regarding invasive procedures and demographic characteristics except nurses' sex, marital status, nursing experience had no statistically significant relation with practice. this finding agreement with **(Bayomi & Taha, 2022)** who studied "Effect of Self –Learning Package on Nurses' Knowledge and Practice Regarding Arterial Blood Gases Analysis for Critically Ill Patients " demonstrated that there non-significant correlation between nurses'

sex and marital status and their practice. This finding contraindicated with (**Abd El Azeem, Shehata & Ibrahim, 2025)** revealed that there no significant statistical relation between demographic characteristics of nurses and their practice.

Regarding to correlation between total knowledge, total practices and total factors among studied nurses, present study revealed that there was statistically significant correlations matrix between studied nurse's total knowledge and total practices. And also, there was statistically significant correlations matrix between the studied nurses' total practices and total factors affecting performance regarding invasive procedures in ICU. This result is agreement with (**Mohamed et al., 2023)** who studied "Factors Affecting Nurses' Role Regarding Care of Patients with Acute Organophosphate Poisoning" showed that there was a statistically positive significant and direct correlation between total knowledge with total practice. Also, there was a statistically significant and direct correlation between total practice and total factors affecting nurses' performance. The current finding is disagreement with **(El Desouky, Taha & Hafez, 2020)** showed that there were no statistically significant correlation between Nurses' Knowledge and Practice and factors affecting nurse performance.

Conclusion:

According to results and discussion of present study, it concluded that near to three fifth of studied nurses had unsatisfactory level of total knowledge score and total practice score regarding invasive procedures. Also, the majority of studied nurses their performance regarding invasive procedures affected by nurses, patient, and work-related factors. In addition, there was a statistically significant relation between total nurses' knowledge and total nurses' practice and there was a statistically significant relation between total nurses' practice and total factors related to nurse, patient and work organization.

Recommendations:

Based on the results of the present study, the following recommendations can be suggested:

- Established plan for effective training program should be done periodically and continuously for nurses.
- Standard nursing procedures booklet should be available to guide nurses how to perform invasive procedures.
- Procedures manual handbooks containing necessary information related to all invasive procedures, should be in Arabic language, available and easily used.
- Posters and simple illustrations about invasive procedures should be available in ICU.
- The factors affecting nurses' performance should be evaluated by the nursing management and hospital administration to avoid or correct such factors.

Acknowledgments

The authors are thankful for the administrative staff and participating nurses for their cooperation.

Authors' contributions

S.M.H; suggested the research concept, drafted the proposal, performed data collection and analysis, and drafted them manuscript. N.M.T., M.D.S.S., and F.M.A; contributed to the study by revising and assisting in developing research methodology, data analysis and interpretation, discussion, comparison of results with recent literatures in study field, writing, editing and summarizing of manuscript. All parts in thesis have been revised and approved by all authors.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Funding source

The author received no financial support for the research, authorship, and/or publication of this article.

Table 1: Frequency Distribution of Studied Nurses Regarding Demographic Characteristics (n=60)

Demographic characteristics	No.	%
Sex		
Male	24	40.0
Female	36	60.0
Age		
<25	10	16.7
≥25	50	83.3
Mean ±SD	27.15±4.17	
Marital status		
Married	39	65.0
Un married	21	35.0
Nursing experience		
<5	40	66.7
≥5	20	33.3
Mean ±SD	4.32±3.68	
ICU experience		
<5	43	71.7
≥5	17	28.30
Mean ±SD	3.22±2.27	
Qualification		
Nursing technician institute	18	30.0
Bachelor of nursing	42	70.0
Training		
Yes	44	73.3
No	16	26.7

Table 2: Statistically Relation between Total Knowledge Level and Demographic Characteristics among Studied Nurses(n=60)

Demographic characteristics	Knowledge				X^2	P-value
	Unsatisfactory< 75 % (n=34)		Satisfactory ≥75% (n=26)			
	No.	%	No.	%		
Sex						
Male	9	26.5	15	57.7	5.984	.014*
Female	25	73.5	11	42.3		
Age						
<25	3	8.8	7	26.9	4.401	0.111
≥25	31	91.1	19	73.1		
Marital status						
Married	22	64.7	17	65.4	0.003	0.956
Un married	12	35.3	9	34.6		
Qualification						
Nursing technician institute	16	47.1	2	7.7	10.87	.000**
Bachelor of nursing	18	52.9	24	92.3		

Nursing experience						
<5	28	82.4	12	46.2	11.829	.003*
≥5	6	17.6	14	53.9		
ICU experience						
<5	28	82.4	15	57.7	6.261	.044*
≥5	6	17.6	11	42.3		
Training						
Trained	20	58.8	24	92.3	8.44	.004*
Untrained	14	41.2	2	7.7		

X^2: Chi square test, non-significant p>0.05, * p<0.05:significant, ** p<0.001: highly significant

Table 3: Statistically Relation between Total Practices Level and Demographic Characteristics among Studied Nurses(n=60)

Demographic characteristics	Practices				X^2	P-value
	Unsatisfactory<80 % (n=35)		Satisfactory ≥80% (n=25)			
	No.	%	No.	%		
Sex						
Male	15	42.9	9	36.0	0.286	0.593
Female	20	57.1	16	64.0		
Age						
<25	6	17.1	4	16.0	7.088	.029*
≥25	29	82.9	21	84.0		
Marital status						
Married	23	65.7	16	64.0	0.019	0.891
Un married	12	34.3	9	36.0		
Qualification						
Nursing technician institute	15	42.9	3	12.0	6.612	.010*
Bachelor of nursing	20	57.1	22	88.0		
Nursing experience						
<5	23	65.7	17	68.0	12.73	.002
≥5	12	34.3	8	32.0		
ICU experience						
<5	23	65.7	20	80.0	8.934	.011*
≥5	12	34.3	5	20.0		
Training						
Trained	22	62.9	22	88.0	4.714	.030*
Untrained	13	37.1	3	12.0		

X^2: Chi square test, f: Fisher exact test, non-significant p>0.05, * p<0.05: significant

International Journal of Multiphysics
Volume 18, No. 3, 2024
ISSN: 1750-9548

Table 4: Correlation Matrix between Total Knowledge, Total Practices and total factors among Studied Nurses(N=60)

Variables		Total knowledge	Total practices	Total factors
Total knowledge	r	1	.128	.043
	p-value		.029*	.744
	N	60	60	60
Total practices	r	.128	1	.369
	p-value	.029*		.004*
	N	60	60	60
Total factors	r	.043	.369	1
	p-value	.744	.004*	
	N	60	60	60

R: Pearson 'correlation coefficient, N: Number non-significant p>0.05, *significant p<0.05

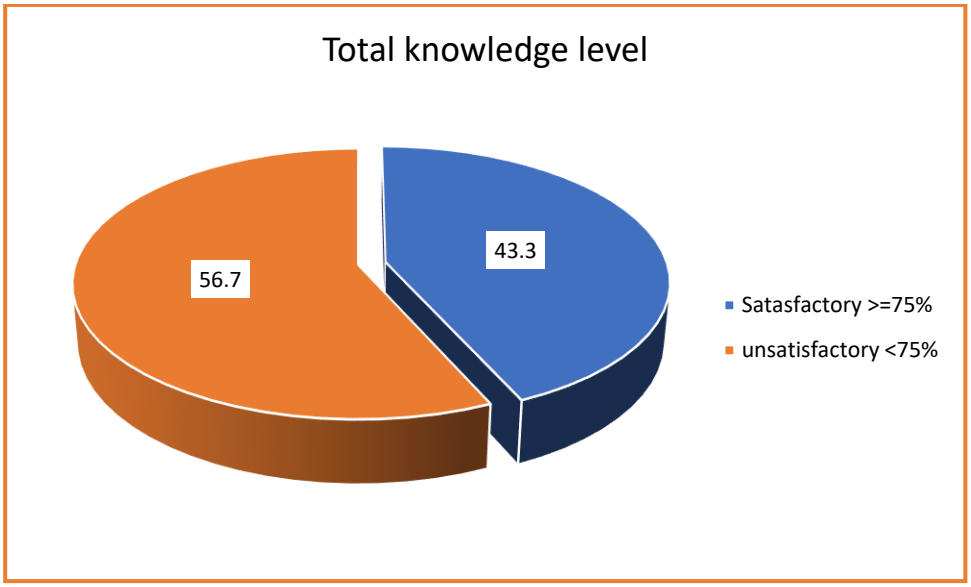

Figure 1: Percentage Distribution of Studied Nurses Regarding Total Knowledge level Regarding Invasive Procedures in Intensive Care Unit.

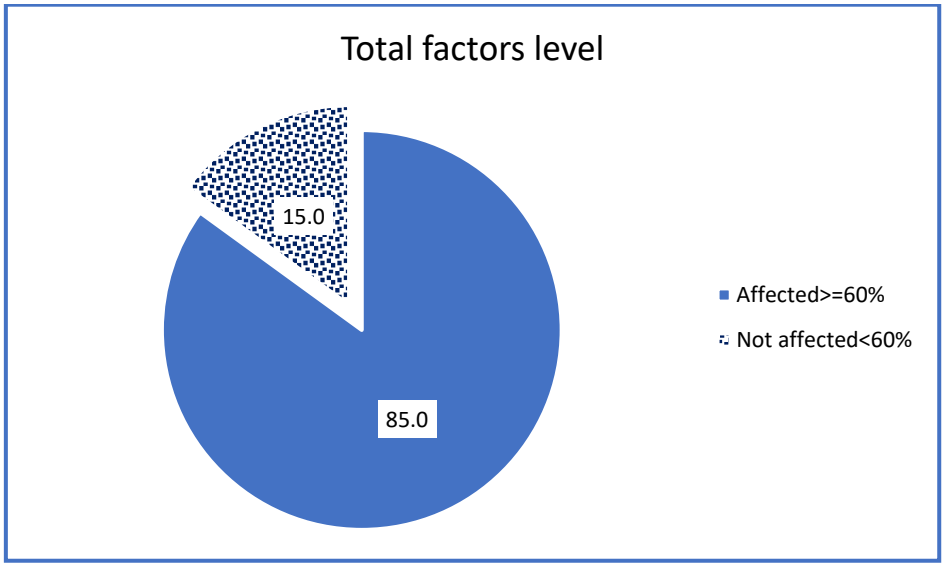

Figure 2: Percentage Distribution of Studied Nurses Regarding Total Factors Affecting the Performance Regarding Invasive Procedures in Intensive Care Units.

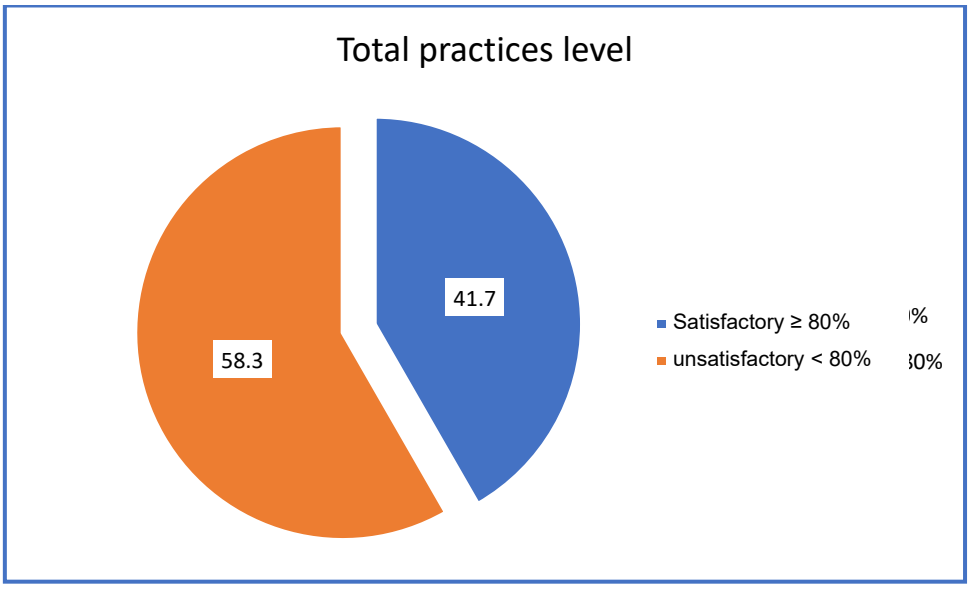

Figure 3: Percentage Distribution of Studied nurses Regarding Total Practices Level Regard Invasive Procedures in Intensive Care Units

References

Abd El Azeem E. G., Shehata A. M., & Ibrahim M. M., (2025): Nurses' Performance regarding Catheter Associated Urinary Tract Infection Bundle in Intensive Care Unit. Journal of Health Care Research; 2(2): 99-119.https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Abd+El+Azeem+++ E.+G.%2C+Shehata++A.+M.%2C+%26+Ibrahim++M.+M.%2C+ %282025%29%3A +Nurses%E2%80%99+Performance+regarding+Catheter+Associated+Urinary+Tract+Infection+ Bundle+ in+Intensive+Care+Unit.+Journal+of+Health+Care+Research&btnG=

Abd rabo F. S. E., Taha N. M., & Moghazy N. A. E., (2024): Factor Affecting Nurses' Performance Regarding Nursing Management of Patients with Hepatic Encephalopathy. Zagazig Nursing Journal; 20(1): 184-204.
https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Abd+rabo+++F.+S.+E.%2C+Taha+++N.+M.%2C+%26+Moghazy++N.+A.+E.%2C+%282024%29%3A+Factor+Affecting+Nurses%E2%80%99+++Performance+Regarding+Nursing+Management+of+Patients+with+Hepatic+Encephalopathy.+Zagazig+Nursing+Journal%3B&btnG=

AbdElbaky M. M., Mohamed E. A., & Nagib R. M., (2018): Impact of Simulated Education program on Nurses' Performance of Invasive Procedure at Intensive Care Units: Evidence Based Practice. International Journal of Nursing Didactics; 8(12): 13-20.
https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=AbdElbaky++M.+M.%2C+Mohamed++E.+A.%2C+%26+Nagib++R.+M.%2C+%282018%29%3A+Impact+of+Simulated+Education+program+on+Nurses%E2%80%99+Performance+of+Invasive+Procedure+at+Intensive+Care+Units%3A+Evidence+Based+Practice.+International+Journal+of+Nursing+Didactics&btnG=

Bayomi R.R., & Taha N.M., (2022): Effect of Self–Learning Package on Nurses' Knowledge and Practice Regarding Arterial Blood Gases Analysis for Critically Ill Patients. Egyptian Journal of Health Care; 13(1): 57-69.
https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Bayomi++R.R.%2C+%26+Taha++N.M.%2C+%282022%29%3A+Effect+of+Self%E2%80%93Learning+Package+on+Nurses

%27+Knowledge+and+Practice+Regarding+Arterial+Blood+Gases+Analysis+for+Critically+Ill+Patients.+Egyptian+Journal+of+Health+Care&btnG=

Chen W., Hu S., Liu X., Wang N., Zhao J., Liu P., & Hu J., (2021): Intensive care nurses' knowledge and practice of evidence-based recommendations for endotracheal suctioning: a multisite cross-sectional study in Changsha, China. BMC nursing; 20: 1-12.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Chen++W.%2C+Hu++S.%2C+Liu++X.%2C+Wang++N.%2C+Zhao++J.%2C+Liu++P.%2C+%26+Hu++J.%2C+%282021%29%3A+Intensive+care+nurses%E2%80%99+knowledge+and+practice+of+evidencebased+recommendations+for+endotracheal+suctioning%3A+a+multisite+crosssectional+study+in+Changsha%2C+China.+BMC+nursing%3B+20%3A+1-12.%E2%80%8F&btnG=

El Desouky N. I., Taha N. M., & Hafez G. E. S., (2020): Factors affecting Nurses' performance regarding the care for patients underwent coronary artery bypass graft. Zagazig Nursing Journal; 16(1): 36-51.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=El+Desouky+++N.+I.%2C+Taha+++N.+M.%2C+%26+Hafez+++G.+E.+S.%2C+%282020%29%3A+Factors+affecting+Nurses%27+performance+regarding+the+care+for+patients+underwent+coronary+artery+bypass+graft.+Zagazig+Nursing+Journal&btnG=

Elbqry M.G., (2024): Nurses' Practice and Knowledge of Peripheral Intravenous Cannula Flushing Pre-Therapy Administration at Medical-Surgical Wards. Egyptian Journal of Health Care; 15(1): 1262-1272.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Elbqry++M.G.%2C+%282024%29%3A+Nurses%E2%80%99+Practice+and+Knowledge+of+Peripheral+Intravenous+Cannula+Flushing+Pre-Therapy+Administration+at+Medical-Surgical+Wards.+Egyptian+Journal+of+Health+Care%3B&btnG=

Expósito L.V., Marañón A.A., Tous M.G., Sánchez M.F., & Pérez E.Z., (2024): Nurses' views on the presence of family members during invasive procedures in hospitalised children: A questionnaire survey. Journal of clinical nursing; 33(10): 3979-3990.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Exp%C3%B3sito++L.V.%2C+Mara%C3%B1%C3%B3n++A.A.%2C+Tous++M.G.%2C+S%C3%A1nchez++M.F.%2C+%26+P%C3%A9rez++E.Z.%2C+%282024%29%3A+Nurses%27+views+on+the+presence+of+family+members+during+invasive+procedures+in+hospitalised+children%3A+A+questionnaire+survey.+Journal+of+clinical+nursing%3B+&btnG=

Gheshlaghi P. A., Farahani Z. B., Anboohi S. Z., Nasiri M., Ziapour A., & Garosi V. H., (2021): Effect of family presence on pain and anxiety levels among patients uring invasive nursing procedures in an emergency department at a public hospital in Western Iran. African Journal of Emergency Medicine; 11(1): 31-36.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Gheshlaghi+++P.+A.%2C+Farahani++++Z.+B.%2C+Anboohi+++S.+Z.%2C+Nasiri+++M.%2C+Ziapour++A.%2C+%26+Garosi+V.+H.%2C+%282021%29%3A+Effect+of+family+presence+on+pain+and+anxiety+levels+among+patients+++uring+invasive+nursing+procedures+in+an+emergency+department+at+a+public+hospital+in+Western+Iran.+African+Journal+of+Emergency+Medicine%3B+11%281%29%3A+31-36.%E2%80%8F&btnG=

Kar G., & Kazan E. E., (2021): Evaluation of skills of intensive care nurses regarding central venous catheter care: An observational study. Marmara Medical Journal; 34(3): 298-306.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Kar++++G.%2C+%26+Kazan++++E.+E.%2C+%282021%29%3A+Evaluation+of+skills+of+intensive+care+nurses+regarding+

central+venous+catheter+care%3A+An+observational+study.+Marmara+Medical+Journal%3B+34%283%29%3A+298-306&btnG=

Maya Á.M.S., (2022): Nursing care during the perioperative within the surgical context. Investigación y Educación en Enfermería; 40(2):1-22.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Maya++%C3%81.M.S.%2C+%282022%29%3A+Nursing+care+during+the+perioperative+within+the+surgical+context.+Investigaci%C3%B3n+y+Educaci%C3%B3n+en+Enfermer%C3%ADa%3B+40%282%29%3A1-22.%E2%80%8F%E2%80%8F&btnG=

Mayez, O.K., Abd El Atty, O., and Mohamed, Y.M. (2022). Nurses Performance Regarding Invasive Procedures in Intensive Care Unit. Egyptian Journal of Health Care,13(2), 594-608.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Mayez%2C+O.K.%2C+Abd+El+Atty%2C+O.%2C+and+Mohamed%2C+Y.M.+%282022%29.+Nurses+Performance+Regarding+Invasive+Procedures+in+Intensive+Care+Unit.+Egyptian+Journal+of+Health+Care%2C13%282%29%2C+594-608.&btnG=

Moghazy N. A. E., Fathy A. M. M., Taha N. M., & Elsyed S. M., (2024): Factors Affecting Nurses' Performance Regarding Prevention of Central Venous Line Associated Infection. Cuestiones de Fisioterapia; 53(3): 1857-1871.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Moghazy+++N.+A.+E.%2C+Fathy+++A.+M.+M.%2C+Taha+++N.+M.%2C+%26+Elsyed+++S.+M.%2C+%282024%29%3A+Factors+Affecting+Nurses%E2%80%99+Performance+Regarding+Prevention+of+Central+Venous+Line+Associated+Infection.+Cuestiones+de+Fisioterapia%3B+53%283%29%3A+1857-1871.%E2%80%8F&btnG=

Mohamed M. M., Taha N. M., Zytoon H. K., & Hafez G. E., (2023): Factors Affecting Nurses' Role Regarding Care of Patients with Acute Organophosphate Poisoning. Zagazig Nursing Journal; 19(1): 66-77.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Mohamed+++M.+M.%2C+Taha++N.+M.%2C+Zytoon++H.+K.%2C+%26+Hafez++G.+E.%2C+%282023%29%3A+Factors+Affecting+Nurses%27+Role+Regarding+Care+of+Patients+with+Acute+Organophosphate+Poisoning.+Zagazig+Nursing+Journal%3B+19%281%29%3A+66-77.&btnG=

Mohamed S. A., Taha N. M., & Bayomi R. R., (2021): Nurses' Role Regarding Care of Patients with Fluid and Electrolyte Imbalance undergoing urinary diversion. Zagazig Nursing Journal; 17(1): 55-65.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Mohamed+++S.+A.%2C+Taha++++N.+M.%2C+%26+Bayomi++++R.+R.%2C+%282021%29%3A+Nurses%27+Role+Regarding+Care+of+Patients+with+Fluid+and+Electrolyte+Imbalance+undergoing+urinary+diversion.+Zagazig+Nursing+Journal%3B+17%281%29%3A+55-65.&btnG=

Moustafa F. N., Hussein H. E. S., Sultan H. M., & Lofty I. M. M., (2024): Assessment of Nurse' Knowledge and Practice Regarding the Maintenance, Care, and Prevention OF Central Venous Catheter-Related Infection in Adult Intensive Care Units in A military Hospital. Journal of the Egyptian Society of Parasitology; 54(1): 157-166.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Moustafa+++F.+N.%2C+Hussein++H.+E.+S.%2C+Sultan+++H.+M.%2C+%26+Lofty++I.+M.+M.%2C+%282024%29%3A+Assessment+of+Nurse%27+Knowledge+and+Practice+Regarding+the+Maintenance%2C+Care%2C+and+Prevention+OF+Central+Venous+CatheterRelated+Infection+in+Adult+Intensive+Care+Units+in+A+military+Hospital.+Journal+of+the+Egyptian+Society+of+Parasitology%3B+54%281%29%3A+157-166.&btnG=

Paiva R.M., Ferreira L.L., Bezerril M.D.S., Chiavone F.T.B., Salvador P.T.C.O., Santos V.E.P., (2021): Infection factors related to nursing procedures in Intensive Care Units: a scoping review. Revista Brasileira de Enfermagem; 74(1): 1-6.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Paiva+++R.M.%2C+Ferreira+++L.L.%2C+Bezerril+++M.D.S.%2C+Chiavone+++F.T.B.%2C+Salvador+++P.T.C.O.%2C+Santos++V.E.P.%2C+%282021%29%3A+Infection+factors+related+to+nursing+procedures+in+Intensive+Care+Units%3A+a+scoping+review.+Revista+Brasileira+de+Enfermagem%3B+74%281%29%3A+1-6.%E2%80%8F&btnG=

Said N. Y., Yassien S., & Ali Ameen D., (2020): Factors affecting nurses' performance toward central line associated blood stream infection in critical care units. Egyptian Journal of Health Care; 11(1): 234-247.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Said++N.+Y.%2C+Yassien++S.%2C+%26+Ali+Ameen++D.%2C+%282020%29%3A+Factors+affecting+nurses%27+performance+toward+central+line+associated+blood+stream+infection+in+critical+care+units.+Egyptian+Journal+of+Health+Care%3B+11%281%29%3A+234-247.&btnG=

Sheta A. E. S., & Tantaewy N.M., (2022): Effect of Evidence Based Program on Critical Care Nurses' Performance Related to Care for Intubated Patients. Egyptian Journal of Health Care;13(1): 1526-1546.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Sheta+++A.+E.+S.%2C+%26+Tantaewy++N.M.%2C+%282022%29%3A+Effect+of+Evidence+Based+Program+on+Critical+Care+Nurses%27+Performance+Related+to+Care+for+Intubated+Patients.+Egyptian+Journal+of+Health+Care%3B13%281%29%3A+1526-1546.%E2%80%8F&btnG=

Shibuya H., Saito A., Mugiyama M., Yamaji N., Eto C., & Shibuya S., (2024): Education Programs for Invasive Procedures Involving Nurses: A Scoping Review. Open Journal of Nursing; 14(5): 200-224.

https://scholar.google.com.eg/scholar?hl=ar&as_sdt=0%2C5&q=Shibuya+++H.%2C+Saito+++A.%2C+Mugiyama+++M.%2C+Yamaji++++N.%2C+Eto+++C.%2C+%26+Shibuya+++S.%2C+%282024%29%3A+Education+Programs+for+Invasive+Procedures+Involving+Nurses%3A+A+Scoping+Review.+Open+Journal+of+Nursing%3B+14%285%29%3A+200-224.&btnG=