

Assessment of Nurses' Performance Regarding the Implementation of Patient Safety Measures in Intensive Care Units

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Abstract

Background: Nursing surveillance is the key to patient safety as nurses can prevent iatrogenic harm and protect patients in intensive care unit (ICU) from medical errors done by others. Role of critical care nurses in patient safety is influenced by the specific requirements of the specialty which need continuous, close monitoring of the patient, dynamic data analysis and anticipation of complications. **Aim of the study:** to assess nurses' performance regarding implementation of patient safety in the intensive care units through assessing nurses' knowledge and performance regarding implementation of patient safety in the intensive care units. **Research design:** A descriptive exploratory design was utilized. **Methods:** **Subject** include all available nurses working in intensive care units in Damanhur Hospital, 50 nurses from both genders, with different ages, educational levels and years of experience was selected for this study. Data were obtained through two main **tools:** 1) Self-administered questionnaire tool, 2) observational checklist which divided to, patient unit observational check list and performance nurses observational check list. **Results:** Nurses had unsatisfactory knowledge and performance. There were statistically significance correlation between nurses knowledge and performance. Knowledge and performance were found to differ significantly in relation to socio-demographic data. **Conclusion:** More than half of the study nurses had unsatisfactory knowledge and performance regarding implementation of patient safety measures. **Recommendations:** The hospital should improve ICU safety structure and design and establishing a protocol to ensure patient safety protocol will be implemented consistently in all ICUs. The study should be replicated on large sample & in different hospitals setting in order to generalize the results.

Key words: Intensive Care Units, Nurses' Performance, Patient Safety.

Introduction

Patient safety is a key component of hospital performance and improving ICU staff nurses' performance remains an ideal that every organization strives to achieve this goal, as well as, when providing the workers with new staff development strategies make their work of a high quality and potential errors are minimized (Vaismoradi, 2017).

Intensive care settings provide lifesaving care for the critically ill patients, however, it is associated with significant risks for adverse events and serious errors with multiple interactions occurring between health multidisciplinary health care providers, patients, and medical devices with increasingly complex interface (Bouldin et al., 2016).

Nursing surveillance is the key to patient safety as nurses can prevent iatrogenic

harm and protect patients in intensive care unit (ICU) from medical errors done by others. Role of critical care nurses in patient safety is influenced by the specific requirements of the specialty which need continuous, close monitoring of the patient, dynamic data analysis, anticipation of complications, complex decision making, continuous evaluation of interventions, and emotional support of the patient and family (Chinn and Kramer, 2017).

Critical care nurses have a developing role in decision making regarding invasive procedures and drug prescriptions as ventilation, fluid and inotrope administration, and renal replacement therapy. They can achieve good outcomes by using of clinical guidelines and protocols (Welch, 2016).

Health care professionals are using multiple methods to improve patient safety and quality outcomes. The most component of patient safety measures are ;patient identification, effective communication, prevention of infection, fall prevention, bed sores prevention, high alert medication precaution, administration of medication and blood transfusion, fire and electricity control (JCI, 2016).

Significance of the study

The occurrence of adverse health events is an indicator of compromised patient safety. Globally, the reported incidence of adverse health events ranges between 4% and 17%. Interestingly, it was found that around 50% of all reported adverse events which compromised patient safety are preventable (Killam et al., 2017).

Nurses' formal educational preparation is reported to be a causal factor of adverse patient events made by around 50% of new nurses with less than one year of experience (Saintsing, Gibson & Pennington, 2016).

Medical practices could that can occur at any stage of the process of management and

cause patient harm in ICU. Critically ill patient will typically experience a mean of 1.7 errors per day. Nearly all patients in an ICU will be affected by a potentially life-threatening error at some point during their stay. Medication errors account for 78% of the serious medical errors in an ICU in addition to accidental patients fall are among the most common adverse events reported in hospitals, complicating approximately 2% of hospital stays (Cho, Park, Choi, Hwang, and Bates, 2016).

The WHO estimated that 7 of every 100 hospitalized patients in developed countries and 10 of 100 in developing countries will acquire at least one health care-associated infection during their hospital stay. In high-income countries, approximately 30% of patients in ICU are affected by at least one health care-associated infection. This percentage is doubled or even tripled among ICU patient in low- and middle-income countries (WHO, a 2016).

Aim of Study

This study aims at assessing nurses' performance regarding the implementation of patient safety measures in I.C.U.

Research questions:

- 1- What are the nurses' knowledge regarding the implementation of patient safety measure in ICU?
- 2- What are the nurses' practices regarding the implementation of patient safety measure in ICU?

Operational definition:

• **Performance:** it means knowledge and practice.

Patientsafety: "the absence of preventable harm to a patient during the process of health care". It means that every patient receives safe health care, every time, everywhere (WHO, a 2016).

Research design:

Descriptive exploratory design was utilized for conduction of the study.

The present study was carried out through:

- I. Technical design.**
- II. Operational design.**
- III. Administrative design.**
- IV. Statistical design.**

I- Technical design:

The technical design includes setting, subject and tools for data collection.

Setting:

The study was conducted in the Intensive Care Units at Damanhur university hospital where divided to two unit unit 1 contain 11bed at second floor and unit 2 contain 8 bed at third floor .

Subject:

Subjects of the present study included all the available nurses working at intensive care units as a convenience sample, including 50 nurses after obtaining their consent to participate in the study. Their educational level was diploma, technical institute and B.Sc. nursing

Tools of data collection:

Data were collected through using the following two different tools.

i- A self-administered questionnaire:

It used for the nurses, it was developed by the investigator in Arabic language based on review of relevant and recent literature(JCI,2016) and consulting expertise in this area.It was used to assess nurses' knowledge regarding the implementation of patient safety measures in I.C. U. total items 59 are divided into eleven parts:

ii- First part was concerned with demographic characteristics data for nurses such

as age, gender, qualifications, clinical experience and training course.

iii- Second part was concerned with information related to patient identification.

iv- Third part was concerned with information related to effective communication.

v- Fourth part was concerned with the information related to infection control.

vi- Fifth part concerned with information related to prevention of patient fall risk.

vii- Sixth part was concerned with information related to prevention of bed sores.

viii- Seventh part was concerned with information related to medication administration.

ix- Eight part was concerned with nurse role related to blood administration and its products.

x- Ninth part was concerned with information related to high alert medication administration.

xi- Tenth part was concerned with information related to electrical safety.

The eleventh part was concerned with information related to fire safety.

➤ Scoring system:

Relation to nurses' knowledge, each question was scored as "0" for incorrect and "1" for correct answer.

○ The total score of the questionnaire was 59 marks.

▪ Below 85% was considered as unsatisfactory < 50 marks.

▪ 85% and above was considered as satisfactory ≥ 50 marks

ii-An observational checklist: It divided to two parts

First part: patient unit characteristics for safety measures.

Second part: It was used to assess the nurses' practice for patient safety measure in their work in intensive care units. It was developed by the investigator based on comprehensive reviewing and recent literature. It will be included: Patient identification, infection control, medication administration, administration of intravenous high alert medications, blood transfusion and its products, fall prevention, pressure ulcer prevention, effective communication, fire and electricity control of safety measures (JCI, 2016).

➤ **Scoring system:**

In relation to nurses' practices, each point was scored as "0" for not done and "1" for done.

- The total score of questionnaire was 240 marks.

Below 90% was considered as unsatisfactory <216 marks.

- 90% and above was considered as satisfactory ≥ 216 marks.

II- Operational design:

It was included preparatory phase, ethical consideration, content validity and reliability, pilot study and field work.

The preparatory Phase:

It was included reviewing of related literatures and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals and magazines to develop tools for data collection.

Ethical approval was obtained from the scientific ethical committee of Ain Shams University. Nurses were assured that anonymity and confidentiality would be guaranteed and the right to withdraw from the study at any time. Ethics, values, culture and beliefs was respected.

Validity and reliability:

Testing validity of the proposed tools by using face and content validity. Face

validity aimed at inspecting the items to determine whether the tools measure what supposed to measure. Content validity was conducted to determine whether the content of the tools cover the aim of the study. This stage developed by a jury of 7 experts, three of them professors and one assistant professor and two of them lecturers of medical surgical nursing at Faculty of Nursing, Ain Shams university and one assistant professor, Faculty of Medicine, Ain Shams University. The experts reviewed the tools for clarity, relevance, comprehensiveness, simplicity and applicability, minor modification was done.

Testing reliability of tools tested by using a Cronbach's alpha for self-administered questionnaire (knowledge) was 0.80 and observational check list (practice) was reliable at 0.85.

Pilot study:

A pilot study was carried out on (10%) five nurses from the study subjects to test the clarity, applicability, feasibility and relevance of the tools used and to determine the needed time for the application of the study tools. The nurses who were included in the pilot study were included to the sample because no modification was done after conducting pilot study.

Field work:

- Purpose of the study was simply explained to the nurses who agree to participate in the study prior to any data collection.

- The study tools was filled in Damamhur Hospital, completed by the investigator. The actual work of this study started and completed within seven months from October (2017) till the end of April (2018).

- The investigator was available 3 days/morning and afternoon shift (Monday, Tuesday, and Wednesday) and the time needed for completing the tools was about 45-60

minute for checklist and about 30 minute for questionnaire for every nurse.

- The self-administered questionnaire sheet was filled by the nurses and the answer recorded by the nurses themselves

- The nurses' level of performance was assessed by the investigator while they are caring for patients in regard to patient safety.

III- Administrative Design:

An official letter was issued from Faculty of Nursing, Ain Shams University to get permission from director of Damam Hospital explaining the purpose of study to obtain the permission for conducting this study.

IV- Statistical Design:

The collected data were organized, categorized, tabulated and statistically analyzed using tables and graphs, appropriate reliable and valid statistical methods and tests to assess nurses' knowledge and practice regarding the implementation of patient safety in intensive care unit. Data were analyzed using Statistical Program for Social Science (SPSS) version 20.0. Quantitative data were expressed as mean \pm standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- Chi-square (X^2) test of significance was used in order to compare proportions between two qualitative parameters.

- Pearson's correlation coefficient (r) test was used for correlating data.

Results:

A total of 50 nurses who completed the questionnaire, had the inclusion criteria

(Table 1): The results showed that regarding to sociodemographic data 80% of the studied nurses were females, 76% of the studied nurses their age ranged between 20-30

years, 40% of the studied nurses had nursing institute. In relation to years of experience 72% of the studied nurses had less than 5 years of experience and 60% of the studied nurses had training courses

(Table 2): Concerning studied total nurses' level of knowledge regarding implementation of patient safety measures. It appears that more than half of the study nurses had unsatisfactory knowledge regarding implementation of patient safety measures in intensive care units (figure 1). As regarding to their total knowledge of studied nurses regarding implementation of safety measures, observed that 68% of the studied nurses had unsatisfactory, and 32% of the studied nurses had satisfactory knowledge related to implementation of patient

safety measure (figure 2). As regarding to their practice of studied nurses regarding implementation of patient safety measures, observed that 70% of the studied nurses had unsatisfactory performances, and 30% of them had satisfactory practice related to implementation of patient safety measures

(Table 3): As regarding the relation between demographic characteristics of studied nurses and total level of their knowledge regarding implementation of patient safety measures, observed that 70.6% of the studied nurses were female, 76.5% of the studied nurses ranged their age between 20-30 years, 35.3% of the studied nurses were nursing diploma, 85.3% of the studied nurses had less than 5 years in intensive care had unsatisfactory knowledge. Also, 52% of the studied nurses had training courses had unsatisfactory knowledge regarding implementation of patient safety measures

(Table 4): As regarding the relation between demographic characteristics of studied nurses and total level of their performance regarding implementation of patient safety measures, observed that 71.43% of the studied nurses were female 82.86% of

the studied nurses ranged their age between 20->30 years 51.43% of the studied nurses were nursing institute 77.14% of the studied nurses had less than 5 year in intensive care had an satisfactory performance. Also, 51.4% of the studied nurses had training courses had unsatisfactory performance regarding implementation of patient safety measures

(Table5): As regarding the correlation between nurses' knowledge and nurses' performance regarding implementation of patient safety measures, show that positive significant correlation between total knowledge and total performance of the nurses under the study regarding implementation of patient safety measures in intensive care units.

Table (1): Number and percentage distribution of demographic characteristics of the studied nurses (N=50).

Demographic Data	No.	%
Gender		
Male	10	20
Female	40	80
Age (years)		
20-30 years	38	76
30-40 years	12	24
Mean±SD	27.28±6.82	
Qualification		
Postgraduate	4	8
Bachelor	14	28
Secondary school diploma	12	24
Technical institute	20	40
Years of Experience		
<5 years	36	72
5-10 years	4	8
>10 years	10	20
Training courses		
Yes	30	60
No	20	40

Table (2): Number and percentage distribution of total nurses level of knowledge regarding implementation of patient safety measures in intensive care units (n=50)

Total Knowledge	Satisfied		Unsatisfied	
	N	%	N	%
Patient identification measure	8	16	2	4
Infection control measure	7	14	3	6
Fall prevention measure	0	0	0	0
Bed sores prevention measure	2	4	8	16
Medication administration	4	8	6	12
High alert medication precaution measure	0	0	4	8
Blood component administration measure	6	12	4	8
Effective communication measure	4	8	6	12
Providing a safe environment for fire and electricity	4	8	6	12
Total	38	76	12	24

Fig (1): Frequency distribution of studied nurses regards their total level of knowledge (n=50).

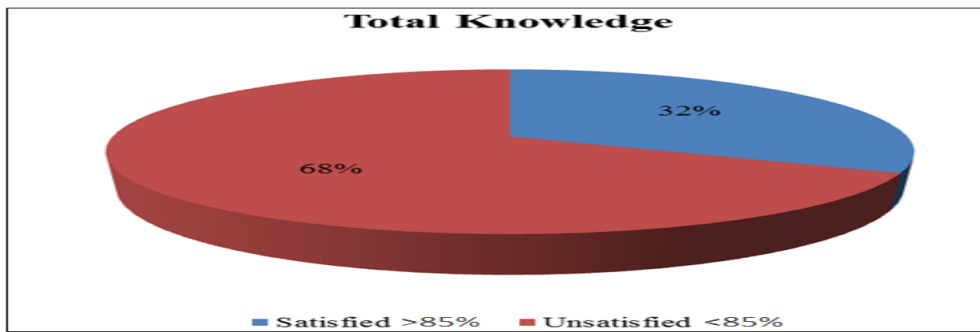


Fig (2): Frequency distribution of studied nurses regards their total performance regarding implementation of patients safety measures (n=50).

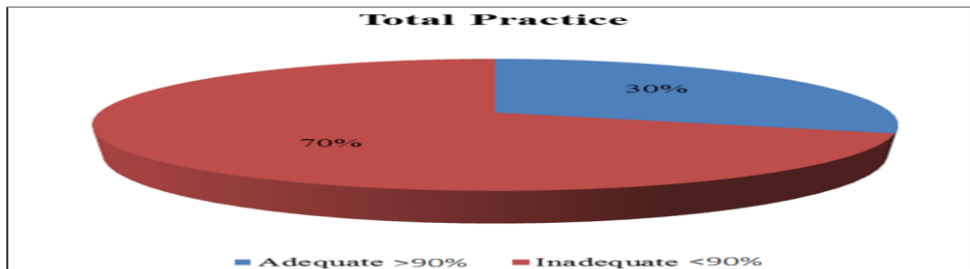


Table (3): Number and percentage distribution of total nurses' level of performance regarding implementation of patient safety measures (n=50).

Total Practice	Satisfactory		Unsatisfactory	
	N	%	N	%
Observe fire control.	3	6	2	4
Observe electrical control.	3	6	1	3
Patients Identification measures.	1	2	3	7
Total Infection Control.	2	4	8	6
Total Selected administration of intravenous high alert medications by infusion pump (dobutamine& KCL) (Steps).	1	2	4	8
Total Blood product transfusion.	2	4	8	6
Fall prevention measures.	1	3	3	6
Pressure Ulcer prevention.	8	6	2	4
Effective communication measures.	2	4	3	6
	0	0	0	0
Total	1	3	3	7
	5	0	5	0

Table (4): Relation between demographic characteristics of studied subjects and total knowledge regarding implementation of patient safety measures in intensive care units (n=50).

Demographic Data	Total Knowledge				Chi-square test	
	Satisfactory (N=16)		unsatisfactory (N=34)		χ^2	p-value
	No	%	No	%		
Gender						
Male	0	0.0%	0	.4%	5.8	0.015*
Female	16	100%	4	.6%	82	
Age (years)						
20-30 years	12	75.0%	6	.5%	0.0	0.910
30-40 years	4	25.0%		.5%	13	
Qualification						
Postgraduate	4	25.0%		0%		19.538 <0.001**
Bachelor	8	50.0%		.6%	17	
Secondary school diploma	0	0.0%	2	.3%	35	
Technical institute	4	25.0%	6	.1%	47	
Years of Experience						
<5 years	7	43.8%	9	.3%	85	19.950 <0.001**
5-10 years	0	0.0%		.8%	11	
>10 years	9	56.3%		9%	2	
Training courses						
Yes	14	87.5%	6	.1%	47	5.825 0.016*
No	2	12.5%	8	.9%	52	

* p-value <0.05 significant; ** p-value <0.001 highly significant

Table (5): Relation between demographic characteristics of studied subjects and total performance regarding implementation of patient safety measures in intensive care units (n=50).

Demographic Data	Total Performance				Chi-square test	
	Adequate (N=15)		Inadequate (N=35)		x ²	P-value
	No.	%	N	%		
Gender						
Male	0	0.0%	1	28.57%	5.357	0.021*
Female	15	100.0%	5	43%		
Age (years)						
20-30 years	9	60.0%	9	86%	3.008	0.083
30-40 years	6	40.0%	6	17.14%		
Qualification						
Postgraduate	4	26.67%	0	0.0%	26.122	<0.001**
Bachelor	9	60.0%	5	14.29%		
Secondary school diploma	0	0.0%	1	34.29%		
Technical institute	2	13.33%	8	43%		
Years of Experience						
<5 years	9	60.0%	7	77.14%	6.429	0.040*
5-10 years	0	0.0%	4	43%		
>10 years	6	40.0%	4	43%		
Training courses						
Yes	13	86.7%	7	48.57%	4.861	0.028*
No	2	13.3%	8	51.43%		

* p-value <0.05 significant; ** p-value <0.001 highly significant

Table (6): Correlation between total nurses level of knowledge and total nurses level of performance (N=50).

		Total performance
Total Knowledge	r	0.767
	p-value	<0.001

Discussion:

The patient safety culture is important in terms of representation of quality healthcare services. Its involves all measure and precautions made for reduction or

elimination of possible adverse effects of medical care during medical diagnosis and treatment. The most frequent problems threatening the patient safety are diagnosis errors, medication errors, hospital infections, bedsores, complications during and after the operation, errors induced by breakdown of

equipment's-appliances, falls and ventilator-related errors (**Ozata & Altunkan, 2016**).

Nurses working at intensive care units have a crucial role in the establishment of a safe and qualified care for the patients.

ICU nurses are the personnel who give constant care, apply complicated medications, use various technological equipments, and offer care to patients in need of advanced life support. For this reason, it is of great significance for the nurses to adopt, defend, and have a critical perspective on the issue of patient safety to offer a prolonged and safe care. It is required to determine primarily the patient safety culture in the institution in order to enhance the patient safety culture and prevent deficiencies, practices or risk factors causing medical errors (**Vicdan&Ozer, 2015**).

Discussion of the present study is categorized into the following parts:

- Demographic characteristics of the studied nurses.
- Physical unit design at critical care unit regarding safety measures.
- Nurses' level of knowledge.
- Nurses' level of practices.
- Relations and correlation between variables under study.

Demographic characteristics:

Regarding the studied nurses demographic characteristics, the result of the present study revealed that the majority of the study nurses were female. This may be due to the greater fraction of the nurses in Egypt was female and may also related to the studying of nursing in Egyptian universities were exclusive for females only till few years ago. These findings were inconsistent with **Hassanin (2016)**, study entitled "nurses performance regarding the neurological assessment in neurological unit" who stated that three quarter of the study subject were female.

Regarding to age, the present study show that mean age of them was (27.28±6.82). This finding was supported by **Ibrahim (2015)** who reported that the mean age of the studied

nurses was (32.32±6.70) with age ranged 20-50years.

Concerning qualifications, this findings showed that less than half of the study nurses were nursing institute, this study disagrees with **El-Gendi, Seung, Abdelsamie and, Feemster (2017)** study entitled "Assessment of Patient Safety Culture among Egyptian Healthcare Employees" who showed that all ICU nurses had a bachelor degree in nursing science.

Regarding years of experience the studied nurses showed that more than two third of them had less than 5 years, this explains that most of those nurses were newly graduated, young and tolerate the nature of the work. This study disagrees with **Kandeel & Tantawy (2014)** entitled "Current Nursing Practice for Prevention of Ventilator Associated Pneumonia in ICUs" who reported that the largest percentage (40.7%) had between 6 and 10 years of ICU experience, and 34% had between 1 and 5 years of ICU experience. This result is in agreement with **Said (2015)** entitled of "Knowledge and practice of intensive care nurses on prevention of ventilator associated pneumonia at Muhimbili national hospital who found that more than two third were working in ICU for less than 10 years.

Regarding training courses the studied nurses showed that two third of the study nurses attend training courses related to patient safety measures ,however, this not reflected on their performance. This may be due to lack of continues education regarding patient safety measures. This finding were contraindicate with **Aboul-Fotouh, Ismail, EzElarab, Wassif (2016)** entitled "Assessment of patient safety culture among healthcare providers at a teaching hospital in Cairo" who found that, less than three quarter didn't receive training course.

Nurses` knowledge:

As regard the basic nurses' knowledge, it was found that less than three quarter of the nurses under study had unsatisfactory knowledge regarding effective communication

measures especially verbal order and red back manner this due to lack of communication courses and work loading. It will lead to developing failure of contingency plans in the event of potential complications.

This finding supported with **Donchin, et al. (2015)** a study conducted to assess the nature and causes of human errors in the intensive care unit, showed that effective communication between medical team especially nursing reduce mistakes in hand offer and provide patient safety in details of patient data.

The results of the current study indicated that more than two third of the studied nurses had unsatisfactory knowledge regarding infection measure. This might be due to Less in continues education and absence of continuous supervision about infection control precaution, this finding contrary with **Escander (2014)** entitled "Intensive care nurses knowledge and practices regarding infection control standard precautions at a selected Egyptian cancer hospital" who reported that majority of nurses had satisfactory knowledge regarding infection control due continues education at 57357 children cancer hospital, also the current study inconsistency with **Asadollahi et al. (2015)** a study entitled "Nurses' Knowledge Regarding Hand Hygiene and Its Individual and Organizational Predictors" who reported that the nurses' knowledge is appropriated in the field of nosocomial precautions particularly about methods of transferring infection and proper time for doing hand hygiene.

The current study shows that more than half of nurses had unsatisfactory knowledge about fire and electricity precaution due to un programmed fire and electricity courses in hospital policy .nurses knowledge about fire and electricity precaution is the back bone for maintenance of humanity, equipment and hospital structure.

This study is consistent with **Farman (2015)** a study entitled " Fire risks in intensive care units and operating theatres - evacuation

of surgical patients" who reported that medical staff are ignorant about institutional fires and their causes. On the other hand, This finding disagree with **Barien (2016)** a study entitled " Assessment of intensive care unit nurses knowledge of electrical safety "who stated in the context entitled " Assessment of intensive care unit nurses· knowledge of electrical safety" that the majority of nurses had satisfactory knowledge about electricity perception due to educational courses in nursing school.

Regarding total nurses' knowledge, the results of the current study indicated that about more than half of the study nurses had unsatisfactory knowledge regarding implementation of patient safety measures in intensive care units. It may due to lack of patient safety courses, although the majority of studied nurses had training courses that may be not updated and not continuous planned patient safety courses in additional to inactivation of in service education department in Damanhur hospital. These results are agreed with **Yilmaz & Goris (2015)** who stated in the context entitled for " Determination of the patient safety culture among nurses working at intensive care units" reported that (64.61%) had unsatisfactory knowledge about patient safety rules and regulation.

Also, this study consisted with **patient safety authority (2015)** which recommended that the majority of incidents reported were related to pressure sores, infection control, patient miss identification, patient falling and medication error due to defect in nurses knowledge.

Nurses' performance:

As regard the basic nurses' practice, it was found that two third of the nurses under study had satisfactory practice regarding present ID band on other hand this study show the majority of the nurses under study had un satisfactory practice regarding full patient name and medical record number ,this might lead to error in any critical procedure such as blood transfusion which lead to reaction and sudden death without accurate

patient identification by medical record number and specific blood type. This is on the same line with **Oliveira, Kovner & Silva (2015)** a study entitled "Patient identification errors from failure to use or check ID numbers correctly" who reported that 98% of incident report related to missing of medical number on patient band.

As regards infection control of studied nurses' practice, the finding revealed that two third of studied nurses had unsatisfactory practice regarding CVP care, arterial puncture and three quarter of studied nurses had unsatisfactory practice regarding tracheal suction. This finding may be due to work loading, shorting staff, and many nurses have false concept about infection control that not necessary to procedures for critical patients.

This disagree with **Escander (2014)** who reported that 57% of studied nurses have satisfactory infection control measure practice about hand hygiene, suction of respiratory track, center line care, urinary catheter care and wound care. This finding related to continues education and training about infection control measures in 57357 children cancer hospital at Egypt.

Regarding fall prevention measures, the finding revealed that more than two third of studied nurses had unsatisfactory practice regarding fall prevention practice. This may be due to shortage of staff and not available good supervision. This consistence with **Spelstra, Given and Given (2014)** a study entitled "Fall prevention in hospitals" who reported that 76% of patient fall injured related to un available of equipment safety strategies to reduce patient fall .

Interdisciplinary training and practice team focused on fall and fall-related injury prevention.

This finding disagree with **Margo, Halm and Patricia (2016)** a study entiteled "Quigley Reducing Falls and Fall-Related Injuries in Acutely and Critically Ill Patients" who reported that 20% of critical ill patient fall at least once, related to implementation of safer environments of care for the whole

patient cohort (ie, flooring, lighting, and observation) and identification of modifiable fall risk factors as well as continues training program of fall prevention.

As regard pressure ulcer prevention, the current study revealed that more than two third of studied nurses had unsatisfactory practice regarding pressure ulcer prevention this may be due to decrease air matrix number in unite, work load and lack in supervision. this finding disagree with **Cox (2014)** entitled for 'Predictors of pressure ulcers in adult critical care patient 'who reported that 85% of patients not have pressure ulcer due to using Braden Scale as a predictor of pressure ulcers in critical care patients, investigation of the contributions of the subscale scores has been limited.

This study is consistent with **Hoviattalab (2014)** entitled for 'Nursing practice in the prevention of pressure ulcers 'who reported that preventive interventions were provided inadequately for patients at high risk for pressure ulcers. Some of the areas where the practice of nurses do not adhere to the national guidelines include undertaking risks assessments as well as nutritional assessments and use of support surfaces when patients were either in bed or in a chair.

Regarding to blood transfusion practice, the present study revealed that more than have of studied nurses had unsatisfactory practice regarding blood transfusion practice this finding may be due to lack in training, increased number of patients and absence of supervision. This finding consisted with **Michelle (2016)** entitled for 'Preventing Blood Component Administration Errors" who reported that 65% of studied nurses have unsatisfactory practice of blood component transfusion especially in monitoring and early detection of reaction that it reduce adverse events and to intercept healthcare errors before they happen.

This study disagree with **Abdou & Saber (2016)** entitled for 'A Baseline Assessment of Patient Safety Culture among Nurses 'that report that 86% of studied nurses

have satisfactory practice after training program course about before, during and after blood transfusion in addition to present available and good quality of equipment which lead to good quality of nurse practice.

As regard to practice of selected high alert medication administration revealed that three quartered of studied nurses had unsatisfactory practice before administration, during administration and after administration. Several factor may attribute to this such as inadequate knowledge about administration of high alert medication, in adequate staffing nurse, work loud in addition to in adequate communication between nurses and physician and unavailable good status of infusion pump.

The current study finding agreed with **Mohamed (2014)** who stated in a study which was entitled: "Assessment of nurses knowledge and practice of high alert medication among critically ill patient" who reported the majority of the studied subject have un satisfactory practices related to administration of high alert medication which appeared in not preparing equipment, not checking prescribed medication, not monitoring volume of fluid infused at least every hour, not monitoring patient vital signs during administration of selected high alert medication in addition to monitoring for extravasation and electrolyte levels.

In relation to administration phase of selected high alert medication, the current study finding revealed more than two third of the studied subjects have in correct practices regarding of dobutamine and potassium chloride. This finding is on the same line with **Calabres et al. (2015)** a study entitled for "Medication administration error in adult patient in ICU" who reported that after grouping the targeted medication according to therapeutic classes, vaso active drugs were involved in the highest number errors.

Regarding to effective communication practice the current study indicated that two third of the studied nurses had un satisfactory practices about critical lab result should be reported immediately to I.C.U nurse, verbal

telephone order physician should sign within 24 hrs from receiving and using read back process in verbal order. This may due to lack communication knowledge which provided by courses in addition to the majority of studied nurses have experience less than 5 years that may associated with effective communication, problem solving and provide model of successful nurse. This study disagree with **Laurel, Despins & Aprn (2014)** who indicated that most immediate outcome of team training is improved team behaviors. Effective team behaviors result in greater patient safety through reduction of medical errors and better management of incident.

In relation to hand over the present study finding revealed that's more than half of studied nurses do hand over at the end of shift but approximately three quarter have un satisfactory notifying about errors or mistake that happen to patient care because of their fairness from punishment that lead to patient harm without identifying the Cause and early solving.

This result supported by **Spooner et al. (2016)** who reported that 60% absence of recommendation hand over as blood results and medication orders that lead to errors by the incoming clinician thereby compromising patient care.

Regarding to fire control practice, this study revealed that, two third of studied nurses have unsatisfactory fire control practice. This may due to the majority of nurse believe that it is out of duty and their work loud in addition to policy of hospital consider fire training courses are extensive and very cost that related to in adequate financially.

The present study disagree with **American Staffing Association (2016)**.

Which show that registered nurses playing a major role. But this is a huge misconception. Hospitals, health clinics and even nursing homes are high risks facilities in regards to being hazardous for fires. This fire safety courses are meant to raise awareness

about the actions necessary in case of a fire at facility, in addition to a trained staff is the best tool to prevent fires from occurring. Some of patients are immobile and will be unable to help themselves in case of a fire emergency situation. Therefore, it is extremely important that fire safety hazards be discussed and effective procedures be set in place to secure the vital safety of all patients and staff members alike.

Regarding to practice electricity control, the current study revealed that more than two third of studied nurses have unsatisfactory practice. This may be due to work over loud, increase number of patient and inadequate knowledge about electricity safety measure. This study disagree with **Berger (2014)** study entitled " Guidelines for developing an effective electrical safety program." who reported that the majority of studied nurse have fair electrical safety practice related to nurses understand and awareness about the fundamentals of patient care equipment as well as safe use of that equipment by effective electricity safety programed courses.

Furthermore, the current study disagree with **AL-Ishaq (2014)** study entitled for " Nursing perceptions of patient safety at Hamad Medical Corporation "who reported that 77% of nursing staff have positive and satisfactory practice regarding patient safety.

Regarding total nurses' practice, the results of the current study indicated that about more than half of the study nurses had un satisfactory practice regarding implementation patient safety measures in intensive care unit at Damanhur general hospital .this may to unavailable in service education to updating knowledge and inadequate supervision which it is early detection of mistake to prevent harm patient care.

This reason of finding is agree with **Cox and Cheyne (2015)** who assured in the study which was entitled " Assessing safety culture in environments" that direct observation of employees is one way of identifying the number and nature of minor

accidents and near miss occurrences and a behavioral checklist can be developed which lists those behaviors associated with preventing incidents and accidents.

Furthermore the current study disagree with **AL-Ishaq (2014)** who reported that 77% of nursing staff have positive and satisfactory practice regarding patient safety at Hamad Hospital that related to continues education and training, effective in service education, good supervision and available of all facility and equipment which improve patient safety and job satisfaction.

Relations and correlation between variables under study

Regarding relation between demographic characteristics and nurses' knowledge regarding implementation patient safety measures.

The current study indicated that there was high statistically significant relation between nurses' knowledge and their qualification and years of experience, also moderate significant relation between nurses' knowledge and their age and gender. The finding was in agreement with **Mati (2017)** who reported that there is strong correlation between years of experiences, qualification about implementation patient safety measures.

Moreover, there is negative relation between age and nurses' knowledge regarding implementation patient safety measures. This result is disagree with **Alwutaib, Abdulghafour, Afladhli, Malboul & El-Shazly (2014)** mentioned that older age is an important determinant of lower level of knowledge score of universal precaution.

Regarding training courses, the result of current study show that moderate statistical significant relation between nurses had training courses and their knowledge. This may be un continuous courses to upgrade and refresh knowledge.

Regarding relation between demographic characteristics and nurses 'practice regarding implementation of patient

safety measures the current study show that there was high statistically significant relation between the nurses' practice and their qualification. This finding is supported with **John, Arifullaa, Cheriathu, & Sreedharan (2015)**, a study revealed that nurses with baccalaureate degree had slightly higher median practice score than diploma holders. The current study show that moderate statistically significant relation between the nurses' practice and their gender, year of experience and training courses. This finding is in accordance with **Al-Youssif & Mohamed (2014)** illustrated that weak statistically significant correlation between participant's age and experience with practice.

This study revealed that there was positive correlation and significant between total knowledge and total practice. This finding is agreed with **Hassan & Ahmed (2015)** revealed that there were statistical significant correlation between educational levels & attending programs and total scores of nurses compliance to safety practices regarding administration of high alert medication.

This finding reflects that nurses performance is based on their knowledge. This finding agreed with **Shaheen, Mahros, Hegazy & Salem (2016)** who revealed statistically significant positive correlation between knowledge and practice of universal precaution.

Conclusion

Based on findings of the current study, it can be concluded that, the current study indicated that more than half of the study nurses had unsatisfactory knowledge and practice regarding implementation of patient safety measures. Moreover, there was statistical significant relation and positive correlation between total knowledge and total practice as regards their demographic characteristics: education and years of experience. The unsatisfactory nurses' knowledge and practice related to patient safety measures may be a reason of in effective patient health care, long patient staying in ICU and increase mortality.

Recommendations

Based on findings of the present study, it recommended that:

- The hospital should improve ICU safety structure and design
- In service education should provide in hospital to improve nurses performance regarding patient safety measures through acquiring knowledge and through implementing the established standers of care which must be up dated periodically.
- Standard nursing procedures booklets should be available and developed in areas of patient safety.
- Posters and simple illustrations about precaution of patient safety should be available in every intensive care unit.
- Sufficient number of nurses with high qualification must be available
- Close supervision and teaching on spot is needed to ensure that quality of care is provided by nurses while performing any procedures related to patient safety.
- A similar study should be replicated on a large sample and other place to generalize the findings.

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