

Effect of Implementing Nursing care Protocol on Critical Patients' Safety Outcomes

A.A.Mahmoud, M.M.Ragheb, S.S.Mohamed & R.A.Ibraheem
Medical surgical nursing , Dept., Faculty of nursing, Benha Univ., Benha, Egypt

Abstract

Background Patients' safety is fundamental to the provision of health care in all settings. However, avoidable adverse events, errors and risks associated with health care remain major challenges for patient safety globally. They contribute significantly to the burden of harm due to unsafe care. Aim: This study aims to evaluate the effect of implementing nursing care protocol on critical patients' safety outcomes. Design: A quasi experimental - design was utilized to achieve the aim of this study. Setting: The study was conducted in the general intensive care unit at Benha University Hospital. Subjects: Convenience sample of all available nurses (٦٣ nurses) who are working in ICU & A purposive sample of ٦٠ consecutive eligible patients who attended to ICU within ٦ months. Result: revealed that, the post mean knowledge and practice scores of nurses regard patients' safety that were exposed to nursing care protocol were higher than their pretest knowledge mean scores, as regard to patients' safety outcomes found that improved post the nursing care protocol than pre protocol, there were positive correlations between total nurses' knowledge and practice and laboratory investigation, general signs and symptoms of infection, local signs and symptoms of infection, physiological parameters measurement on admission and after one week. Conclusion: the total mean score of nurses' knowledge was improved after implementation of nursing care protocol than pre implementation, The total mean score of nurses' practice was improved after implementation of nursing care protocol than pre implementation with highly statistically significant differences among all items pre and post nursing care protocol implementation & there was an improvement in patient' safety outcomes for study group than control group after one week with statistically significance difference. Recommendation: The study recommended that; In service education should provide in hospital to improve nurses' performance regarding patient safety measures through acquiring knowledge and through implementing the established standards of care which must be updated periodically.

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

١. Introduction

Patient safety is an important branch of knowledge, which has emerged within the past two decades. However, the definition and structure of the field remain nebulous despite its wide acceptance and legitimacy. Therefore, it is crucial to define and present the structure of patient safety to create a shared image of the concept. Patient safety could be defined as the elimination of damages in patients, as well as a state of no possible harms to patients. In this regard, 'patients' and 'harm' are defined based on the cultural constructs in different regions and epochs. With the progress of communities, individuals might be included and excluded from the proposed definitions of 'patients' and 'harms' as these concepts constantly evolve throughout time (٢٧).

Patient safety is fundamental to the provision of health care in all settings. However, avoidable adverse events, errors and risks associated with health care remain major challenges for patient safety globally. They contribute significantly to the burden of harm due to unsafe care. Available evidence suggests that hospitalizations in low- and middle-income countries lead to ١٣٤ million adverse events annually, contributing to ٢.٦ million deaths. Estimates indicate that in high-income countries, about ١ in ١٠ patients is harmed while receiving hospital care (٥٥).

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 (٢٧).

An ICU is an organized system for the provision of care to critically ill patients that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of acute organ system insufficiency. Although an ICU is based in a defined geographic area of a hospital, its activities often extend beyond the walls of the physical space to include the emergency department, hospital ward, and follow-up clinic (٢٥).

Medication errors in critical care are frequent, serious, and predictable. Critically ill patients are prescribed twice as many medications as patients outside of the intensive care unit (ICU) and nearly all will suffer a potentially life-threatening error at some point during their stay. Medication errors management is a key component of nursing care provision and competence in this role is

crucial. The role of the nurse in medication management has evolved significantly in recent years and indeed is likely to continue to develop in response to healthcare. This can be achieved by identifying and adopting safety measures and where necessary facilitating a culture that will enhance patient safety (۲۹).

Nosocomial infection is a major public health concern throughout the world, it contributes to elongation of hospital stay, long term or permanent disability and death, each year health systems spend a considerable number of resources, including high end antibiotics, health professional work time and hospital space to treat the consequence of nosocomial infection. Critical ill patients are at high risk of developing infection due to the immune suppression and prolonged hospitalization. Also, the nurses are at high risk of developing blood borne infections due to the unsafe use of injection equipment, other medical devices, and blood products in the critical care units. Several studies recommended that competent infection control practices should be established at critical care units to prevent transmission of bacteria and viruses (۲۲).

Infection control standard precautions include certain measures such as use of aseptic technique, hand hygiene, use of personal protective equipment (PPE), sharps safety, staff health, safe use and disposal of sharps, safe injection practices, environmental cleaning, reprocessing of equipment, single use policy and waste management. Nurses serve an important role in preventing the transfer of organism in two ways, first, as the nurse must disinfect their hands before and after contact with patients and after performing a potentially hand contaminating activity. The second way that nurses reduce hand to hand spread that serve as patients advocates. With the number of health care workers involved in patient care each day, there is a significant opportunity for breaks in hand hygiene technique (۱۴) & (۱۲).

Despite all advances in health care, pressure ulcers (PUs) remain an old worldwide public health problem related to patient safety. Hospital-acquired PUs are one of the most harmful events in the clinical context. PUs, recently known as pressure injuries, are defined as skin injuries and/or underlying tissue damage localized over a bony prominence, resulting from pressure force and/or pressure combined with shear. PUs result in significant physical, psychological, and social problems related to lower quality of life, increasing dependence, and frailty of patients. They increase health care costs and are recognized as an indicator of the quality of

care provided in health care institutions. In most of the clinical contexts, PUs are predictable and preventable with interventions and evidence-based practice guidelines (۲۱).

Although the prevention of pressure ulcers is a multidisciplinary responsibility, nurses play a major role. Nurses are encouraged to review the comprehensive guidelines regarding specific processes (e.g., risk assessment, skin care, mechanical loading, patient and staff education, etc.) that, when implemented, could reduce pressure ulcer development, and the literature suggests that following these specific processes of pressure ulcer care will reduce the incidence of ulcers. Research also suggests that when the health care providers are functioning as a team, the incidence rates of pressure ulcers can decrease. Thus, pressure ulcers and their prevention should be considered a patient safety goal (۲۲).

Inpatient falls in any setting are generally believed to translate into significant morbidity but falls occurring in a heightened monitored setting such as the ICU are of particular concern. ICUs have unique organizational structures to meet the high intensity workload associated with support of critically ill patients. ICU patients generally have high acuity of illness, multiple organ dysfunction and require at least some enhanced monitoring or advanced life support (invasive and non-invasive ventilation, vasoactive therapy, and renal replacement therapy (RRT) (۴۲).

Staff nurses may have the greatest impact on reducing patient falls. Due to their ۲۴-hr presence, nurses have the most consistent contact with patients and continually monitor for conditional changes. When falls occur, nurses often become the "second victim" expressing increased stress, anxiety, guilt, concern for liability, and self-doubt about the quality of care they provide. The American Nurses Association and the National Quality Forum use patient falls as a nursing-sensitive quality indicator, placing the responsibility for patient falls directly on nursing staff. This blame, along with potential pressure from administration to reduce falls due to CMS penalties may alter how nurses care for fall risk patients (۲۹).

Critically ill patients admitted to the intensive care unit commonly suffer from pain that can range from mild to extremely severe. There are many potential causes for pain in critically ill patients during their ICU stay. Pain usually results from the primary disease process and tissue injury, invasive procedures, endotracheal suctioning, immobility, turning and mobilization. As most patients in the intensive care unit are critically ill, they are

unable to verbally communicate, and report pain they are experiencing. Therefore, physical signs in these patients must always be monitored to detect and assess pain (۹).

Recent guidelines for pain management should be well applied by physicians, nurses, and all the team responsible for the care of the patient. Rapid and effective relief of pain play a significant role in decreasing stress, preventing complications, and improving quality of life after discharge. If pain not recognized and treated, it may have a significant negative impact on patient outcomes (۱۰).

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 (۵۴).

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 (۱۱).

۲. Aim of the study

This study aims to evaluate the effect of implementing nursing care protocol on critical patients' safety outcomes.

۲.۱ Research Hypotheses

- H^۱- The mean score of nurses' knowledge post the nursing care protocol will be higher than mean score of nurses' knowledge pre protocol.
- H^۲-The mean score of nurses' practice post the nursing care protocol will be higher than mean score of nurses' practice pre protocol.
- H^۳-There will be improving in patients' safety outcomes post the nursing care protocol higher than pre protocol.

۲. Subject and Method

۲.۱ Research design

۲.۴ Scoring system

۱. Nurses' knowledge about patients' safety: it consists of ۲ MCQ about (definition of patients' safety and goals of patients' safety).
۲. Nurses' knowledge about medication errors: it consists of ۲۳ MCQ as (preparation of medication, medication administration, medication storage & medication documentation).

A quasi experimental - design was utilized to achieve the aim of this study.

Setting

The study was conducted in the general intensive care unit at Benha University Hospital that located at second floor and contain four rooms plus one isolation room each room contain four separated beds equipped with mechanical ventilator.

۳. Sample

a- Nurses

Convenience sample of all available nurses (۱۳ nurses) who are working in ICU and are assigned for caring the patients. They are willing to participate in the study.

b- Patients

A purposive sample of ۶۰ consecutive eligible patients who attended to the above-mentioned setting within ۶ months ago. The subjects were eligible in the study were adult patients from both sexes who are newly admitted not more than ۴۸ hrs with stable condition and free from pressure ulcer. Subjects recruited were allocated and classified into two equal groups, ۳۰ patients (control group) pre protocol who received care according to hospital routine and ۳۰ patients (study group) post protocol who received nursing care protocol.

۳. Tools for data collection

Tools of data collection

Data of the present study was collected by using the following three tools.

Nurses Structured Questionnaire

It was designed by the researcher through a review of related and recent literature, it was adapted from (*Elgazar, et al, ۲۰۲۰; Burns et al, ۲۰۲۰; Fleming & Martin ۲۰۱۸; Aboelfetoh et al., ۲۰۱۷; Lewis, et al, ۲۰۱۶*). It aimed to assess nurses' knowledge related to patients' safety. It comprised two parts:

- Part ۱: Concerning socio-demographic characteristics for nurses related to their age, gender, marital status, educational level, position, years of work experience in the ICU, and attendance of training programs about patients' safety.
- Part ۲: This part concerned with assessment of nurses' knowledge.

It consists of ۶ parts as follow:

۳. Nurses' knowledge about infection prevention: it consists of ۱۴ MCQ as (general knowledge about infection, ICU cleaning) and ۴۳ Yes or No questions as (knowledge about hospital acquired infection, general infection control standard as personnel hygiene-hand washing-personnel protective equipment-cleaning of ICU equipment) and environmental infection control).

۴. Nurses' knowledge about pressure ulcer prevention: it consists of ۷ MCQ as (definition pressure ulcer, symptoms of pressure ulcer, risk factors, assessment and stages of pressure ulcer) and ۲۳ Yes or No questions about (nursing care of pressure ulcer).
۵. Nurses' knowledge about fall prevention: it consists of ۲۰ MCQ such as risk factors of fall, assessment and Morse fall scale, measures of fall prevention and nursing care of patient fall.
۶. Nurses' knowledge about pain management: it consists of ۱۱ MCQ as (definition of pain, causes, complications and assessment of pain).
۷. Nurses' knowledge about care of intubated patient: it consists of ۱۹ MCQ as (nursing care of mechanically ventilated patient, safety precautions for intravenous fluid and blood administration) and ۴ True or False about (urinary catheter care).

Scoring system

The correct answers were given one score and the wrong answers were given zero score. These scores were summed-up and converted into a percent score.

- **Total knowledge score:** ۱۶۶ equal (۱۰۰٪)
- Score from >۸۰ referred to satisfactory knowledge.
- Score from ۶۰-۸۰ referred to unsatisfactory knowledge.

۳.۵ Reliability

This tool was tested for reliability to estimates the consistency of measurement. Reliability was done using Alfa Coefficient test was ۰.۷۷

II- patient safety Practices observational checklist:

It was adapted from (*Burns et al, ۲۰۲۰; Elgazar, et al, ۲۰۲۰; McCutcheon & Doyle, ۲۰۱۸; Floyd, ۲۰۱۸; Aboelfetoh et al., ۲۰۱۷*) and modified to suit the nature of the study after review of related literature. It was used to assess the nurses' practices related to safety measures in the ICU unit such as medication administration, infection control, safety measures for pressure ulcer prevention, safety measures for falls prevention, management of pain, safety measures for intubated patient and safety measures during transfer.

۳.۶ Scoring system

The response to each item in the procedures was categorized into the completely done, incompletely done and not done. Total score for every checklist was calculated and converted into percent, then categorized as follow: Scores of (۱) were

allotted to steps done correct (completely done), and zero were allotted to steps done incorrect (incompletely done and not done). Total nurses practice score was calculated then converted to mean percent score.

۳.۷ Practice total score: ۲۱۰ equal (۱۰۰٪)

- Score from >۸۰ referred to competent practice.
- Score from ۶۰-۸۰ referred to incompetent practice.

۳.۸ Reliability

This tool was tested for reliability to estimates the consistency of measurement. Reliability was done using Alfa Coefficient test was ۰.۸۱.

III- Patients' Safety outcomes checklist

This assessment sheet was developed by the researcher in English language after reviewing the related literature (*Burns et al, ۲۰۲۰; Elgazar, et al, ۲۰۲۰; McCutcheon & Doyle, ۲۰۱۸; Floyd, ۲۰۱۸*). It comprised two parts:

- Part ۱: Patients' socio-demographic characteristics will include: age, sex, medical history, diagnosis and duration of admission.

- Part ۲: this part concerned with assessed signs and symptoms of hospital acquired infection. It consists of three parts:

I- Laboratory investigation as follow: WBC, C- reactive protein (CRP) rate and ESR.

II- General Signs and symptoms of infection such as: elevate of temperature, chills, sweats and pain.

III- Local signs and symptoms of infection such as: redness, swelling, warmth at the site and soreness.

- Part ۳: this part concerned with Physiological parameters for patient such as pulse, respiration, temperature, blood pressure and O_۲ saturation.

- Part ۴: this part concerned with Clinical risk assessment tool are specific assessments that are used to measure levels of risk for certain procedures and out comes such as Braden scale which adopted from Braden et al., (۱۹۸۷) used to predict pressure sore risk.

It is a summated rating scale composed of six subscales: sensory perception, moisture, activity, mobility, nutrition, friction and shear. The six subscales are related from ۱ (least impairment) to ۴ (most impairment) except friction and shear, which rates from ۱-۳.

۳.۹ Scoring system

- ۱۹-۲۳ → No risk
- ۱۵-۱۸ → Mild risk
- ۱۳-۱۴ → Moderate risk
- Less than ۹ → Sever risk

Part ۵: this part concerned with Fall's risk assessment which adapted from Morse, Black & Oberle (۱۹۸۹). which used to predict the likelihood of a fall occurring and composed of six items: history of falling, secondary diagnosis, ambulatory aid, iv/heparin lock, gait/transferring and mental status.

Scoring system

- $< ۲۵ \rightarrow$ Low risk
- $۲۵-۴۵ \rightarrow$ Moderate risk
- $> ۴۵ \rightarrow$ High risk

Part ۶: this part concerned with Critical pain assessment scale that include or the Critical-Care Pain Observation Tool (CPOT) adopted from Gelin, Fillion&Puntillo (۲۰۰۹) to assess unconsciousness and critically ill adult patients' behaviors indicators for pain. It composed of four items: facial expression, body movement, muscle tension and compliance with ventilator for intubated patients or vocalization for extubated patient. Each item of CPOT scored from (۰ to ۲) with total score of ۸ it was divided as the following: -

- ۰ degree \rightarrow No pain
- ۱-۲ degree \rightarrow Mild pain
- ۳-۶ degree \rightarrow Moderate pain
- above ۶ degrees \rightarrow Sever pain.

۲.۱.۱ Reliability

This tool was tested for reliability to estimate the consistency of measurement. Reliability was done using Alfa Coefficient test was:

- Clinical risk assessment tool ۰.۸۵
- Critical pain assessment scale ۰.۸۳

۲.۱.۲ Nursing care protocol

This protocol was developed by the researcher in the form of Arabic booklet after reviewing related literature (*Elgazar, et al, ۲۰۲۰; Burns et al, ۲۰۲۰; Fleming & Martin ۲۰۱۸; Aboelfetoh et al., ۲۰۱۷; Lewis, et al, ۲۰۱۷*) and included theoretical and practical parts that conclude knowledge about i.e., a definition of patients' safety, a definition of adverse events, causes of adverse events and nurses' performance regarding safety measures about prevention of medication errors, prevention of infection, prevention of pressure ulcer, prevention of falls, management of pain, care of intubated patients and care during transfer.

۲.۱.۳ Ethical considerations

- The research approval was obtained from the ethical committee of faculty of nursing before initiating the study work.
- The researcher clarified the purpose and aim of the study to nurses and patients included in the study before data collection.
- Oral consent was obtained from nurses to participate in the study.

- The researcher assured maintaining, anonymity and confidentiality of subjects' data and that, it will be used for research purpose only.
- The subjects were informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time.

۲.۱.۴ Statistical analysis

Data were verified prior to entry into the computer. The Statistical Package for Social Sciences (SPSS version ۲۰) was used for that purpose, followed by data analysis and tabulation. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). The statistical tests were used as Paired (t) test was used to compare mean scores between the same sample at different study phases while Chi square was used for number and percent distribution, and Spearman correlation test (r) was used to define correlation among socio- demographic characteristics and the study sample at different study phases. A highly significant level value was considered when $p \leq ۰.۰۰۱$, while a significant level value was considered when $p \leq ۰.۰۵$, and insignificant when $p > ۰.۰۵$.

۲.۱.۵ Limitations of the study

The researcher was confronted with a few obstacles during the implementation of the study as:

Administrative limitation

- The time for giving the session for intern-nurses who were distributed in different units was difficult to be organized.
- Obtaining training classes in some time were so difficult because the student of faculty of medicine were using these training classes.
- Obtaining a patient file was difficult because the nursing staff work load add to the fact that the ticket is not organized and the patient information is unclear and incomplete.

۲.۱ Technical limitation

- There were some problems with internet connections, such as the speed or the absence of a mobile signal where they were staying.
- The difficulty of downloading the application due to the speed the internet because it is an internet package and internet memory stick (Internet flash) and the cost to the researcher Net package. Which lead to distribution of the intern-nurses group into subgroups and sometime intern-nurses were requested to complete the EHRs sheet in the home as the availability of Wi-Fi connection and send them back to the researcher to complete the observation.

۴. Results

Table (۱): This table shows number and percentage distribution of the studied nurses according to their socio-demographic characteristics, It reveals that, ۵۰.۸% of the studied nurses were in the age category ۲۵-۳۵ years with the mean \pm SD ۳۳.۱ \pm ۲.۳۱, ۷۱.۴% were females and ۸۲.۵% were married. In relation to qualification, ۵۷.۲% had technical nursing institute and ۶۹.۸% were nurses. Regarding to years of experience, ۵۵.۶% had experience years from ۵-۱۰ years and ۸۱.۰% hadn't attended any training courses related to patient safety in ICU.

Table (۲): This table illustrates comparison between total nurses' knowledge at pre and post implementation of nursing care protocol. It shows that the mean score of total knowledge was ۵۲.۹ \pm ۱۵.۲۰ pre nursing care protocol implementation, which improved to ۱۳۲.۵ \pm ۳۷.۹ post nursing care protocol implementation. With highly statistically significant differences among all items pre and post nursing care protocol implementation at ($p \leq .001$).

Table (۳): This table clearly shows comparison between total nurses' practice at pre and post implementation of nursing care protocol. It demonstrates that, the total mean score of nurse's practices was ۸۶.۷ \pm ۲۳.۵ pre

nursing care protocol implementation. However, post implementation improved to ۱۷۶.۸ \pm ۴۰.۱. also, there were highly statistically significant difference between all items pre & post implementation at $p < .001$.

Table (۴): This table clearly shows that there is a highly significant positive correlation between total nurses' knowledge and their practice at pre and post implementation of nursing care protocol where $p < .001$.

Table (۵): This table shows number and percentage distribution of the studied patients (study and control group) according to their socio-demographic data. It reveals that regarding age (۴۳.۳%, ۴۰% respectively) of both control & study group their age was from ۵۱-۶۰ years old with mean \pm SD was (۵۴.۳ \pm ۱۰.۸ & ۵۳.۷ \pm ۹.۸) respectively), regarding gender (۶۰%, ۵۳.۳% respectively) were males regarding medical history (۴۰%, ۳۳.۳% respectively) of control & study group had hypertension and (۲۶.۷% & ۲۳.۳% respectively) of control & study group had history of previous ICU admission. Concerning diagnosis (۲۶.۷% & ۳۰% respectively) of control & study group had brain hemorrhage and duration of hospital stay was one day with percentage (۶۰% & ۵۶.۷% respectively) of both groups.

Table (۶): shows the comparison between the studied patients (control and study group) regarding to total Braden scale on admission and after one week. As evidence it clarifies that (۴۰%, ۴۰% respectively) of both control and study group were at moderate risk on admission with no significant difference between them. While after one week (۲۶.۷%, ۵۰% respectively) of control and study group were at mild risk with highly statistically significant difference between both groups at $p \leq .001$.

Table (۷): points out the comparison between the studied patients (study and control group) regarding to total fall's risk assessment on admission and after one week. As evidence it clarifies that (۴۶.۷%, ۴۰.۷% respectively) of both control and study group were at moderate risk on admission with no significant difference between them. While after one week (۲۶.۷%, ۴۰% respectively) of control and study group were at low risk with highly statistically significant difference between both groups at $p \leq .001$.

Table (۸): points out the comparison between the studied patients (control and study group) regarding to total critical pain assessment scale on admission and after one week. As evidence it clarifies that (۵۳.۳%, ۵۰% respectively) of both control and study group had moderate pain on admission with no significant difference between them. While

after one week (۲۰%, ۳۳.۳% respectively) of control and study group had mild pain with highly statistically significant difference between both groups at $p \leq ۰.۰۰۱$.

Table (۹): This table shows the correlation between total nurses' knowledge and practice at pre-implementation of nursing care protocol and patients' outcome (for study group). It points out that there were positive correlations between total nurses' knowledge and practice and laboratory investigation, general signs and symptoms of infection, local signs and symptoms of infection, physiological parameters measurement on admission and after one week with highly statistically significance difference at $p \leq ۰.۰۰۱$.

Also, there were positive correlations between total nurses' knowledge and practice and total Braden scale on admission and after one week with statistically significance difference at $p < ۰.۰۵$. while there were

negative correlation between total nurses' knowledge and practice and total fall risk assessment scale, total critical pain assessment scale with statistically significance difference at $p < ۰.۰۵$.

Figure (۱): demonstrates that, only ۲۲.۲% of the studied nurses had satisfactory level of knowledge pre nursing care protocol implementation, while post nursing care protocol implementation, ۸۴.۱% of them had satisfactory level of total knowledge about patient safety.

Figure (۲): shows percentage distribution of total nurses' practice at pre and post implementation of nursing care protocol. It demonstrates that, one quarter (۲۵.۴%) of the studied nurses had competent level of practices, while post implementation majority of them (۷۹.۴%) had competent level of practice

Table ۱: Number and percentage distribution of the studied nurses according to their socio-demographic characteristics (N=۶۳)

Socio demographic characteristics	The studied sample (n=۶۳)	
	N	%
Age (Year)		
< ۲۵	۱۰	۱۵.۹
۲۵ - < ۳۵	۳۲	۵۰.۸
۳۵ - < ۴۵	۱۵	۲۳.۸
۴۵-۵۵	۶	۹.۵
Mean SD	۳۳.۱ ± ۲.۳۱	
Gender		
Male	۱۸	۲۸.۶
Female	۴۵	۷۱.۴
Marital Status		
Single	۷	۱۱.۱
Married	۵۲	۸۲.۵
Divorced	۲	۳.۲
Widowed	۲	۳.۲
Position		
Staff Nurse.	۵۳	۸۴.۱
Head Nurse	۱۰	۱۵.۹
Qualification		
A high school diploma in nursing	۸	۱۲.۷
A technical nursing institute	۳۶	۵۷.۲
A bachelor's degree in nursing	۱۴	۲۲.۲
Postgraduate studies	۵	۷.۹
Job Title		
A nursing specialist	۹	۱۴.۳
A nurse	۴۴	۶۹.۸
Head nurse	۱۰	۱۵.۹
Experience years		
< ۵	۱۲	۱۹
۵ - < ۱۰	۳۵	۵۵.۶
۱۰ - < ۱۵	۸	۱۲.۷
۱۵ - < ۲۰	۵	۷.۹
≥ ۲۰	۳	۴.۸
Mean SD	۸.۶۹ ± ۳.۹۰	
Attended any training course related to the safety of critically ill patients in the intensive care unit		
Yes	۱۲	۱۹
No	۵۱	۸۱
If yes, When did you receive this training course(n=۱۲)		
Less than one year	۲	۱۶.۷
One year	۳	۲۵
Three years	۷	۵۸.۳

Table ۲: Comparison between total nurses' knowledge at pre and post implementation of nursing care protocol (N=۶۳)

Nurses' knowledge	The studied sample (n=۶۳)								Chi square test	
	Pre nursing care protocol				Post nursing care protocol				X ^۲	p-value
	Satisfactor		Unsatisfactory		Satisfactor		Unsatisfactory			
y	N	%	N	%	y	N	%	N	%	
Prevention of medication errors	۲۶	۴۱.۳	۳۷	۵۸.۷	۵۴	۸۵.۷	۹	۱۴.۳	۴۱.۵۵	.۰۰۰**
Prevention of infection	۲۴	۳۸.۱	۳۹	۶۱.۹	۵۲	۸۲.۳	۱۱	۱۷.۷	۳۶.۸۷	.۰۰۰**
Prevention of bed sores	۱۸	۲۸.۶	۴۵	۷۱.۴	۵۰	۷۹.۴	۱۳	۲۰.۶	۴۰.۵۸	.۰۰۰**
Prevention of fall	۲۵	۳۹.۷	۳۸	۶۰.۳	۵۴	۸۵.۷	۹	۱۴.۳	۳۷.۶۸	.۰۰۰**
Pain assessment	۱۳	۲۰.۶	۵۰	۷۹.۴	۵۶	۸۸.۷	۷	۱۱.۳	۳۷.۷۸	.۰۰۰**
Care of intubated patient	۱۶	۲۵.۴	۴۷	۷۴.۶	۵۵	۸۷.۳	۸	۱۲.۷	۳۲.۹۱	.۰۰۰**
Total	۱۴	۲۲.۲	۴۹	۷۷.۸	۵۳	۸۴.۱	۱۰	۱۵.۹	۴۲.۶۳	.۰۰۰**
Mean SD	۵۲.۹±۱۵.۲				۱۳۲.۵±۳۷.۹					

(*) Statistically significant at $p \leq .05$. (**) highly statistically significant at $p \leq .001$.

Table ۳: Comparison between total nurses' practice at pre and post implementation of nursing care protocol (N=۶۳)

Nurses' practice	The studied sample (n=۶۳)								Chi square test	
	Pre nursing care protocol				Post nursing care protocol				X ^۲	p-value
	Competent		Incompetent		Competent		Incompetent			
N	%	N	%	N	%	N	%			
Nurses' practices regarding patients' safety during medication administration	۲۰	۴۷.۶	۲۳	۵۲.۴	۵۲	۸۲.۳	۱۱	۱۷.۷	۳۴.۳۲	.۰۰۱**
Nurses' practices regarding medication error reporting	۱۰	۱۵.۴	۵۳	۸۴.۶	۴۸	۷۶.۳	۱۵	۲۳.۷	۳۲.۳۶	.۰۰۰**
Nurses' practices regarding infection control	۲۴	۳۸.۱	۳۹	۶۱.۹	۵۲	۸۲.۳	۱۱	۱۷.۷	۳۱.۹۵	.۰۰۰**
Nurses' practices regarding pressure ulcer prevention	۱۴	۲۲.۲	۴۹	۷۷.۸	۵۰	۷۹.۴	۱۳	۲۰.۶	۳۴.۷۸	.۰۰۰**
Nurses' practices regarding fall prevention	۲۵	۳۹.۷	۳۸	۶۰.۳	۵۰	۷۹.۴	۱۳	۲۰.۶	۲۵.۳۰	.۰۰۰**
Nurses' practices regarding pain management	۱۲	۱۹.۰	۵۱	۸۰.۰	۵۴	۸۵.۷	۹	۱۴.۳	۲۹.۸۴	.۰۰۰**
Nurses' practices regarding care of intubated patient	۲۰	۳۱.۴	۴۳	۶۸.۶	۵۵	۸۷.۳	۸	۱۲.۷	۲۵.۵۱	.۰۰۰**
Total	۱۶	۲۵.۴	۴۷	۷۴.۶	۵۰	۷۹.۴	۱۳	۲۰.۶	۳۳.۰۸	.۰۰۰**
Mean SD	۸۶.۷±۲۳.۵				۱۷۶.۸±۴۰.۱					

(**) highly statistically significant at $p < .001$.

Table ۴: Correlation between total nurses' knowledge and their practice at pre and post implementation of nursing care protocol (N=۶۳).

Variables	Total nurses' practice	
	Pre	Post
Total nurses' knowledge	r	۰.۵۶۳
	p	.۰۰۰**

**highly significant at $p < .001$.

Table ۵: Number and percentage distribution of the studied patients (control and study group) according to their socio-demographic data.

Socio-Demographic Data	Control group (n=۳۰)		Study group (n=۳۰)		Test of Sig.	
	N	%	N	%	X ^۲	P-value
Age (year)					۱.۵۱۰	.۲۴۱
۳۰ - ۴۰	۳	۱۰	۲	۶.۷		
۴۱ - ۵۰	۶	۲۰	۷	۲۳.۳		
۵۱ - ۶۰	۱۳	۴۳.۳	۱۲	۴۰		
>۶۰	۸	۲۶.۷	۹	۳۰		
Mean SD	۵۴.۳ ± ۱۰.۸		۵۳.۷ ± ۹.۸۱		t=۱.۹۶۴	.۲۰۹
Gender					۱.۴۶۷	.۲۹۹
Male	۱۸	۶۰	۱۶	۵۳.۳		
Female	۱۲	۴۰	۱۴	۴۶.۷		
Medical history					۱.۲۱۰	.۳۱۰
Hypertension	۱۲	۴۰	۱۰	۳۳.۳		
Diabetes mellitus	۶	۲۰	۸	۲۶.۷		
Cardiac disease	۴	۱۳.۳	۵	۱۶.۷		
Previous ICU admission	۸	۲۶.۷	۷	۲۳.۳		
Diagnosis					.۹۹۲	۱.۰۱۷
Brain tumor	۴	۱۳.۳	۴	۱۳.۳		
Poly-trauma	۵	۱۶.۷	۶	۲۰		
Heart failure	۳	۱۰	۳	۱۰		
Brain Hemorrhage	۸	۲۶.۷	۹	۳۰		
Diabetic ketoacidosis	۳	۱۰	۳	۱۰		
Other	۷	۲۳.۳	۵	۱۶.۷		
Duration of hospital stay (Day)					۱.۰۳۷	.۳۸۴
New admission	۵	۱۶.۷	۷	۲۳.۳		
One day	۱۸	۶۰	۱۷	۵۶.۷		
Two days	۷	۲۳.۳	۶	۲۰		

No significant at $p > .۰۰۵$.

Table ۶: Comparison between the studied patients (control and study group) regarding to total Braden scale on admission and after one week.

Total Braden scale	Control group (n=۳۰)				Study group (n=۳۰)				Test of Sig. (p _۱)	Test of Sig. (p _۲)
	On admission		After one week		On admission		After one week			
	N	%	N	%	N	%	N	%		
No risk	۴	۱۳.۳	۵	۱۶.۷	۲	۶.۷	۷	۲۳.۳		
Mild risk	۶	۲۰	۸	۲۶.۷	۷	۲۳.۳	۱۵	۵۰	X ^۲ =۱.۳۴	X ^۲ =۱۲.۱
Moderate risk	۱۲	۴۰	۱۱	۳۶.۷	۱۲	۴۰	۶	۲۰	P=۰.۳۲۲	P=۰.۰۰۰*
Severe risk	۸	۲۶.۷	۶	۲۰	۹	۳۰	۲	۶.۷		*

X^۲: Chi-square p= p-value

P_۱: p value for comparing between the (Control group and Study group) on admission.

P_۲: p value for comparing between the (Control group and Study group) after one week.

***: Highly statistically significant at $p \leq .۰۰۱$. No significant at $p > .۰۰۵$.

Table ۷: Comparison between the studied patients (control and study group) regarding to total fall's risk assessment on admission and after one week.

Total fall's risk assessment	Control group (n=۳۰)				Study group (n=۳۰)				Test of Sig. (p _۱)	Test of Sig. (p _۲)
	On admission		After one week		On admission		After one week			
	N	%	N	%	N	%	N	%		
Low risk	۶	۲۰	۸	۲۶.۷	۵	۱۶.۷	۱۲	۴۰		
Moderate risk	۱۴	۴۶.۷	۱۲	۴۰	۱۴	۴۶.۷	۱۱	۳۶.۷	X ^۲ =	X ^۲ =
									۱.۱۱۹	۱۴.۰۱
									P=۰.۳۸۷	P=۰.۰۰۰*

High risk	۱۰	۳۳.۳	۱۰	۳۳.۳	۱۱	۳۶.۷	۷	۲۳.۳	*
				۳		۷			

χ^2 : Chi-square

p= p-value

P_۱: p value for comparing between the (Control group and Study group) on admission.

P_۲: p value for comparing between the (Control group and Study group) after one week.

** : Highly statistically significant at $p \leq 0.001$. No significant at $p > 0.05$.

Table ۸: Comparison between the studied patients (control and study group) regarding to total critical pain assessment scale on admission and after one week.

Total critical pain assessment scale	Control group (n=۳۰)				Study group (n=۳۰)				Test of Sig. (P _۱)	Test of Sig. (P _۲)
	On admission		After one week		On admission		After one week			
	N	%	N	%	N	%	N	%		
No pain	۲	۶.۷	۲	۶.۷	۲	۶.۷	۴	۱۳.۳	$\chi^2 = 0.874$	$\chi^2 = 1.77$
Mild pain	۴	۱۳.۳	۶	۲۰	۳	۱۰	۱۰	۳۳.۳	p=0.001	P=0.003*
Moderate pain	۱۶	۵۳.۳	۱۵	۵۰	۱۵	۵۰	۱۲	۴۰		*
Severe pain	۸	۲۶.۷	۷	۲۳.۳	۱۰	۳۳.۳	۴	۱۳.۳		
				۳		۳				

t: t. test

p= p-value

P_۱: p value for comparing between the (Control group) on admission and after one week.

P_۲: p value for comparing between the (Study group) on admission and after one week.

** : Highly statistically significant at $p \leq 0.001$. No significant at $p > 0.05$.

Table ۹: Correlation between total nurses' knowledge and practice at post implementation of nursing care protocol and total Braden scale of the (study patients), total fall's risk assessment and total critical pain assessment scale.

Variables			Total nurses' knowledge	Total nurses' practice
Laboratory investigation	On admission	r	0.106	0.116
		p	0.100	0.190
	(After one week)	r	0.390	0.402
		p	0.001**	0.001**
General signs and symptoms of infection	On admission	r	0.120	0.117
		p	0.110	0.101
	(After one week)	r	0.372	0.399
		p	0.001**	0.001**
Local signs and symptoms of infection	On admission	r	0.101	0.109
		p	0.140	0.102
	(After one week)	r	0.301	0.380
		p	0.01**	0.001**
Physiological parameters measurement	On admission	r	0.110	0.100
		p	0.131	0.137
	(After one week)	r	0.300	0.386
		p	0.01**	0.001**
Total Braden scale	On admission	r	0.214	0.239
		p	0.17*	0.027*
	(After one week)	r	0.328	0.337
		p	0.06**	0.01**
Total fall's risk assessment	On admission	r	-0.233	-0.240
		p	0.01*	0.01*
	(After one week)	r	-0.340	-0.304
		p	0.01**	0.01**
Total critical pain assessment scale	On admission	r	-0.294	-0.277
		p	0.01*	0.01*
	(After one week)	r	-0.331	-0.342
		p	0.01**	0.01**

* Significant at $p < 0.05$. ** : Highly statistically significant at $p \leq 0.001$. No significant at $p > 0.05$.

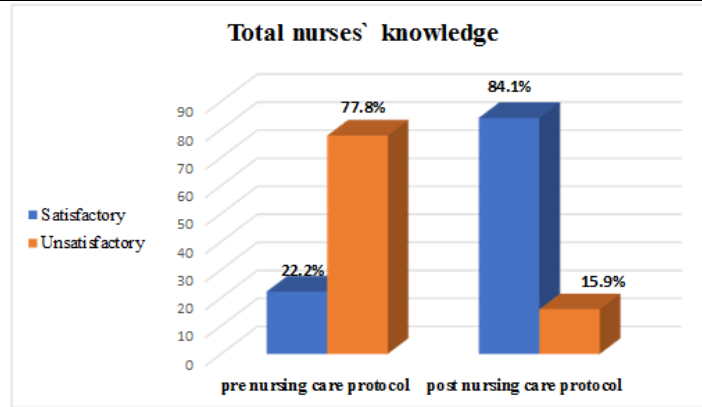


Fig ۱: Percentage distribution of total nurses' knowledge about patient safety at pre and post implementation of nursing care protocol (n=۶۳).

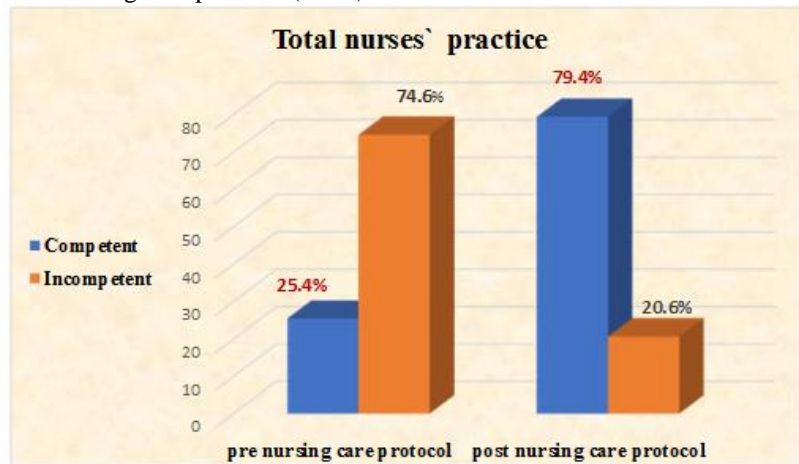


Fig ۲: Percentage distribution of total nurses' practice at pre and post implementation of nursing care protocol (n=۶۳).

•.Discussion

Regarding to the personal characteristics of intern-nurses, the findings of the present study reveals that more than half of intern-nurses had age more than half of studied nurses were at the age group between ۲۵- < ۳۵ years old with mean \pm SD ۲۳.۱ \pm ۲.۳. This may be reflect the demanding nature of critical care units service, so that older nurses may find it difficult to cope with the load of work required and newly graduate preferred to work in the critical care units as they have the ability to acquire knowledge and change their behaviors based on submission of up to date knowledge. This result is in line with (۳۴) who studied about " assessment of nurses' performance regarding the implementation of patient safety measures in intensive care units " stated that nearly three quarters of the respondents were age ranged between ۲۰-۳۰.

Also, this finding is in the line with (۱۸) who studied about "effect of instructional program on nurses' compliance with universal precautions of infection control", stated that nearly three quarter of the respondents were age ranged between ۲۰ to ۳۹ years old.

On the other hand, this finding disagree with (۳۱) whose study was about " assessment of nurses' knowledge toward vascular access devices for patients with hemodialysis at Baghdad teaching hospital", illustrated that more than half of the studied nurses their age ranged between were ۳۰ > ۴۰ years.

In the present study, more than two thirds of the studied nurses were females. 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 in consistent with (۳۲) who studied about " nurses' performance regarding the neurological assessment in neurological unit" reported that three quarters of the study subject were female. but it disagrees with (۱) in their study about "Knowledge and practices of nurses regarding nosocomial infection control measures in private hospitals in Sana'a City, Yemen" stated that the highest percentage of nurses were males (۶۱.۲%).

Regard to marital status, the result of the study reveals that, majority of the studied nurses were married. This finding is in

agreement with, (۳۱) who reported that majority of the studied nurses were married. From the researcher point of view this may be due to the studied nurses were at the age group that known in Egypt that they married.

Concerning qualification, the current study findings shows that more than half of the study nurses had technical nursing institute, this is in the same line with (۳۴) who reported that nearly half of the study nurses were nursing institute. But this study disagrees with (۱۷) in study entitled " Assessment of Patient Safety Culture among Egyptian Healthcare Employees "who showed that all ICU nurses had a bachelor's degree in nursing science.

Regarding years of experience the current study shows that more than half of the studied nurses had ۵-۱۰ years, this explains that most of those nurses were newly graduated, young and tolerate the nature of the work, this finding is supported by (۱۸) who reported that more than half of the studied nurses had less than ۵ years of experience from years of work experience.

This result is in agreement with (۴۹) in his study entitled "Knowledge and practice of intensive care nurses on prevention of ventilator associated pneumonia at Muhimbili national hospital" who found that more than two thirds of nurses were working in ICU for less than ۱۰ years. Also, this study in the line with (۲۸) who studied "current nursing practice for prevention of ventilator associated pneumonia in ICUs" reported that the largest percentage (۴۰.۷%) had between ۶ and ۱۰ years of ICU experience, and ۳۴% had between ۱ and ۵ years of ICU experience.

But this study disagrees with (۳۴) who reported that more than two thirds of nurses had less than ۵ years. Also, this finding disagrees with (۴۲) who studied "Vascular access care at hemodialysis unit; nurses' compliance to infection prevention and control practices" reported that half of the studied nurses had years of experience range from ۱۰ - < ۲۰ years.

Regard to past training courses about patient safety, the result of current study reveals that majority of nurses hadn't attended any training courses related to patient safety in ICU. The finding of the current study can be explained in the light of the belief that lack of hospital financial resources for training or shortage of nursing staff and work overload which considered as a barrier for nurses to leave the work and attend training course. This finding is in agreement with (۴۶) who conducted a study titled " effect of training program on reduction of nurse's medication

errors" and stated that few of staff nurses attended training program about medication administration.

Furthermore, this finding is in consistence with (۴) who conducted a study entitled " patient safety culture among nurses working in Palestinian governmental hospital: a pathway to a new policy " stated that the majority of participants reported that they had not received any previous patient safety training.

Regarding total nurses' knowledge at pre and post implementation of nursing care protocol. The current study result reveals that the mean score of total knowledge was increased post nursing care protocol implementation than before. Also, there were highly statistically significance difference between all items of knowledge at $p \leq 0.001$.

This result of study is in the same line with study done by (۵۰) entitled " Effect of training program on nurses' performance regarding care for patients under mechanical ventilator in intensive care units " stated that there were significant differences increase in total nurse knowledge score throughout the study.

Also, this result in agreement with (۳۳) in study about " Effectiveness of planned teaching program on knowledge and practice of endotracheal suctioning among staff nurses in selected hospitals of Mangalore" who illustrated that nurse' knowledge was improved post - test than pre -test.

Regarding total nurses' knowledge at pre and post implementation of nursing care protocol. The current study result reveals that less than one quarter of the studied nurses had satisfactory level of knowledge pre nursing care protocol implementation, while post nursing care protocol implementation, majority of them had satisfactory level of total knowledge about patient safety. From the researcher point of view, the unsatisfactory level of knowledge pre protocol may be due to lack of patient safety courses and majority of studied nurses had not trained about planned patient safety courses and not updated their knowledge in additional to inactivation of in-service education department.

This is in line with (۳۴) who indicated that about more than half of the study nurses had unsatisfactory knowledge regarding implementation of patient safety measures in intensive care units. Also, these results are agreed with (۵۶) who stated in the context entitled " Determination of the patient safety culture among nurses working at intensive care units" reported that two thirds of nurses had unsatisfactory knowledge about patient safety rules and regulation.

Furthermore, this study consisted with *patient safety authority*, (۲۰۱۵) 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. Also, *The American Association of Colleges of Nursing*, (۲۰۱۹) recommended that improving nurses' practice mainly depends upon improving knowledge regarding patient' safety principles.

As regard to total nurses' practice at pre and post implementation of nursing care protocol. The current study result reveals that, total mean score of all practices were improved post nursing care protocol implementation than pre implementation with highly statistically significant differences between all practices at pre and post implementation.

This is supported by (۲) who conduct their study to evaluate effect of training on nurses' knowledge and skills and revealed that there was a highly statistically significant differences between level of acquired nurses' practices pre/post the interactive training.

Moreover, this finding is in agreement with (۳۲) who concluded that there was a statistically significant difference between before and after educational program for patient on mechanical ventilation regarding total nurses' practice scores. Adding, that adequate performance infection controls standard precautions which increases after application of the education.

This result of study is in the same line with study done by (۵۰) there was highly statistical significance difference on the nurses practice at pre, post the training the program as patient safety considerations are worth noting first. Patients receiving mechanical ventilation in ICU require continuous observation and monitoring

As regard to total nurses' practice at pre and post implementation of nursing care protocol. Also, the finding of the study demonstrates that, one quarter of the studied nurses had competent level of practices pre implementation, while post implementation majority of them had competent level of practice.

At the same line, a study done by (۱۹) approved that studied nurses had competence level regarding patient safety assurance throughout infection control, environmental safety, and proper dealing with surgical specimen after implementation of program.

Furthermore, the current study disagrees with (۵) that titled " Nursing perceptions of patient safety at Hamad Medical Corporation" who reported that ۷۷% of nursing staff have

positive and satisfactory practice regarding patient safety at Hamad Hospital.

The present study reveals that there is a highly significant positive correlation between total nurses' knowledge and their practice at pre and post implementation of nursing care protocol where $p < ۰.۰۰۱$. This result indicated that practice can be improved especially if linked with relevant scientific base of knowledge.

This result of study is in the same line with study done by (۳۸) entitled " Impact of nursing intervention protocol about polytrauma care during the golden hour on nurses' performance " showed that there was a highly statistically significant correlation between total practice and total knowledge pre and post implementation of the nursing protocol.

Also, this agrees with (۵۳) entitled " Impact of an educational program on nurses' knowledge and practice regarding care of traumatic brain injury patients at intensive care unit at Suez Canal University Hospital " reported that there is a positive correlation between nurses' knowledge and practice.

According to (۱) revealed that there were strong positive correlation between improvement of knowledge and improvement of practice, immediate and ۳ months post teaching guidelines implementation phases.

Also, in the same line with (۵۲) entitled " Impact of a designed head trauma nursing management protocol on critical care nurses' knowledge and practices at emergency hospital Mansoura University " stated that a highly statistically significant correlation between participants' scores of knowledge and practice in preprogram and post-program.

Regarding sociodemographic characteristics of studied patients, the current study reveals that nearly two fifths of both control & study group at age group from ۵۱- >۶۰ years old with mean of age ۵۴.۳ ± ۱۰.۸ & ۵۳.۷ ± ۹.۸۱ , respectively. From the researcher point of view this may be due to people in this age category, face many respiratory and cardiovascular diseases or infection which affect seriously on patient condition and require ICU admission.

This result is consistent with (۸) who studied about " The effect of implementing clinical alarm nursing intervention program on nurses' knowledge, practice and patient outcomes at intensive care unit " reported that no statistically significant difference was found between two groups in relation socio-demographic characteristics and medical characteristics It was observed that more than one third of control and study group had age between ۴۰- < ۵۰ years.

Also, the result was in congruent with (٥١) who studied about " Effect of shallow versus deep endotracheal tube suctioning on hemodynamic parameters in mechanically ventilated patients in Intensive Care Unit " reported that the majority of studied critically ill patients were at this age and there's no significant difference between two groups in relation to socio-demographic .

This finding is in agreement with (١٣) who study about "effect of implementing a protocol of nursing care on hemodialysis patients ' safety outcomes", who reported that, the majority of the patients were at the age group $٥٠ < ٦٠$. According to (٣٨) who reported that more than half of the control and study group in the age category between $٥٠ - < ٦٠$.

Regarding gender the current study reveals more than half of the studied patients (study and control group) were male. This result is consistent with (٤٧) who study about " Sociodemographic, clinical and laboratory factors on admission associated with COVID-١٩ mortality in hospitalized patients " who reported that slightly more than half of our patients were males. According to (٣٨) who reported that more than half of studied patients in the control and study group were males.

Also, this finding is in agreement with (٣٩) who study about " Effect of implementing nursing care protocol about acute lung injury on patients' outcomes." who reported that, the majority of the patients were males. Also agrees with (٨) who studied about " Efficacy of implementing nursing care protocol on the incidence of ventilator associated pneumonia in Intensive Care Unit at Tanta emergency hospital " reported that more than half of the study samples were males.

Regarding medical history, the current study reveals that two fifths of control group and one third of study group had hypertension. This might be due to two fifths of control and study group were at age category $٥١ > ٦٠$ and in this age most people in Egypt suffer from chronic diseases as hypertension and diabetes mellitus also, this could be as a most common diseases reported all over the world in both developed and developing countries.

This finding is in agreement with (٤٨) who studied about " Impact of Educational Program for Hepatic Encephalopathy on Nurse's Performance and Patient's Outcomes", the majority of studied patients had hypertension, and more than half had Diabetes Mellitus (DM) are associated diseases. According to (٣٨) who reported that more than one quarter of studied patients in the control and study group had hypertension.

Regarding diagnosis, also the current study reveals that more than one quarter of control & study group diagnosed with brain hemorrhage. This might be due to they suffer from hypertension which is the leading cause of brain hemorrhage & stroke. Also, the current study reveals that there were no statistically difference between control & study group regarding sociodemographic data and medical history with $p > ٠.٠٥$ which indicates the two groups were nearly homogenous.

This finding is in the line with (٣٨) who reported that more than one quarter of control & study group diagnosed with brain hemorrhage & stroke.

In concerning to the comparison between the studied patients (control and study group) related to total Braden scale on admission and after one week. The current study clarifies that two fifth of both control and study group were at moderate risk on admission with no significant difference between them. While after one week less than one third and nearly half of control and study group were at mild risk, respectively, with highly statistically significant difference between both groups at $p \leq ٠.٠٠١$. This finding is in the line with (٣٨) who reported that more than one-third of the control and study group were at severe risk on admission, while after two weeks, around one-third and one-fourth of the study group were at moderate risk and mild risk, respectively.

This finding is in agreement with (٣٩) whose study indicated that, there was significant difference between the study and control groups on the ٧rd day, and highly significant difference at the ٧th day related to risk assessment by Braden scale. Also, this finding is in agreement with (١٣) whose study indicated that, on the day of admission, there was no significant difference between the study and control groups related to risk assessment, but there was significant difference at ٧nd to ٤th day. There was moderate significant difference at ٥th to ٧th day then there was highly significant difference at ٧th day.

This finding is in the line with (٣٧) who reported that ٨٠% of all patients were at risk for pressure ulcers based on the total score of the Braden scale pre application of program, while the lowest prevalence among patients ٣٠% after implementing of programs.

Regarding to total fall's risk assessment on admission and after one week. The study clarifies that less than half of both control and study group were at moderate risk on admission with no significant difference between them. While after one week one fifth and two fifth respectively of control and study

group were at low risk with highly statistically significant difference between both groups at $p \leq 0.001$.

This finding is in agreement with (۴۱) who study about " Impact of nurses' intervention in the prevention of falls in hospitalized patients" who concluded that, the systematic assessment of the risk of a patient falling during the hospital processes has proved to be an effective intervention to reduce the incidence of falls, especially in the elderly, who have the most falls. It is, therefore, necessary to implement specific advanced training for all nurses and not as a voluntary training program. There is a need to further improve the evidence on clinical practices to ensure patient safety (such as fall risk prevention), especially with experimental studies.

Regarding to total critical pain assessment scale on admission and after one week. The study clarifies that half of both control and study group had moderate pain on admission with no significant difference between them. While after one week one fifth and one third respectively of control and study group had mild pain with highly statistically significant difference between both groups at $p \leq 0.001$.

In concerning to the correlation between total nurses' knowledge and practice at pre-implementation of nursing care protocol and patients' outcome for study group, the current study clarifies that there were positive correlations between total nurses' knowledge and practice and laboratory investigation, general signs and symptoms of infection, local signs and symptoms of infection, physiological parameters measurement on admission and after one week with highly statistically significance difference at $p \leq 0.001$. This finding emphasized that both knowledge and practice are equally important for the work of the nurse and the focus should be on knowledge utilization clinical nursing requires that nurses to incorporate knowledge and skills into practice to reduce complication. This again clarified the importance of in service training and continuing nursing education.

This finding is in agreement with (۴۸) who reported about correlation between total nurses' Performance and patient outcome pre and post Program. There was a highly statistically significant difference between nurse's performance and patient outcome of educational program.

At the same line study done by (۴۴) entitled as "Effect of Teaching Program on Critical Care Nurses' Performance About end-of-Life Care for Hepatic Patients" In their study showed that there was relation found

between knowledge and practice score before and after the teaching program.

۶. Conclusion

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

- The total mean score of nurses' knowledge was improved after implementation of nursing care protocol than pre implementation. With highly statistically significant differences among all items pre and post nursing care protocol implementation at ($p \leq 0.001$).
- The total mean score of nurses' practice was improved after implementation of nursing care protocol than pre implementation. Also, there were highly statistically significant difference between all items pre & post implementation at $p < 0.001$.
- There is a highly significant positive correlation between total nurses' knowledge and their practice at pre and post implementation of nursing care protocol where $p < 0.001$.
- There was an improvement in patient' safety outcomes for study group than control group after one week with statistically significance difference.

Recommendation:

In the light of the findings obtained from the present study, the following are recommended:

- In service education should provide in hospital to improve nurses' performance regarding patient safety measures through acquiring knowledge and through implementing the established standards of care which must be updated periodically.
- Standard nursing procedures booklets should be available and developed in areas of patient safety in both Arabic and English language.
- Posters and simple illustrations about precaution of patient safety should be available in every intensive care unit.
- 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.

Related to future research:

- A similar study should be replicated on a large sample and other place to generalize the findings.

۷. References

- [۱] M.S.Abd Elhady, Impact of Teaching Guidelines on Improving Nurse's Performance and Patient's Safety Regarding Nosocomial Infection in Dialysis Unit (Doctoral dissertation,

- Benha University.vol.١٥,pp.١٥٥-١٦٠,٢٠١٥.
- [٢] A.Abdelmoaty, H.A Sabry, E.H.ElSebaie, & A.M,Kenawy, Indwelling Urinary Catheter: Effect of Training on Nurses Knowledge and Skills. The Egyptian Family Medicine Journal.vol.٤(١),pp.١٤٤-١٥٧,٢٠٢٠.
- [٣] M.Aboelfetoh, E.A.El Bitar, N.Eid, & S.Mahmoud, Effects of an Educational Program on the Nurses' performance regarding Vascular Access Infection Prevention. Thesis for doctoral degree in nursing science, Medical Surgical Nursing, Faculty of Nursing, Benha University.vol.٥٥,pp.٤٠-٤٤,٢٠١٧.
- [٤] N. I.Abu-El-Noor, M. K.Abu-El-Noor, Y. Z.Abuowda, M.Alfaqawi, & B.Böttcher, Patient safety culture among nurses working in Palestinian governmental hospital: a pathway to a new policy. BMC health services research.vol.١٩(١),pp.١-١١,٢٠١٩.
- [٥] M.AL-Ishaq, Nursing perceptions of patient safety at Hamad Medical Corporation in the State of Qatar available from EKP PROQUEST.vol.٥٧,pp.٦٢٠-٦٥٠,٢٠١٤.
- [٦] A G. G.Irubaiee, A.Baharom, I.Faisal, H. K.Shahar, S. M.Daud, & H. O.Basaleem, Implementation of an educational module on nosocomial infection control measures: a randomised hospital-based trial. BMC nursing.vol.٢٠(١),pp.١-١٠,٢٠٢١.
- [٧] A.Ateyeya, R.Mohamed, & M.Abdel-Aziz, The effect of nursing guidelines for preventing pressure ulcers in intensive care units on patient outcomes.vol.١٠(٣),pp.١٧٩-٢٠١,٢٠١٣.
- [٨] Z. M.Aysha, & S. E.Ahmed, The effect of implementing clinical alarm nursing intervention program on nurses' knowledge, practice and patient outcomes at intensive care unit. Am. J. Nurs. Res.vol.٧,pp.٨٢٤-٨٣٥,٢٠١٩.
- [٩] E.Bouldin, E.Andresen, N.Dunton, M.Simon, T.Waters, and M.Liu. Falls among adult patients hospitalized in the United States: prevalence and trends. J Patient Saf.vol.٩(١),pp.١٣-٧,٢٠١٦.
- [١٠] Z.Burns, P. C.Dykes, J.Adelman, J.Benneyan, M.Bogaitsky, E.Carter, & D. W. BatesEvaluation of a patient-centered fall-prevention tool kit to reduce falls and injuries: a nonrandomized controlled trial. JAMA network open.vol.٣(١١),pp.e٨٨٩-٨٩٩,٢٠٢٠.
- [١١] P.Chinn, & M.Kramer, Integrated Theory and Knowledge Development in Nursing, ٨thedn. St Louis, MO: Mosby.vol.٧٧,pp.٧٨-٨٨,٢٠١٧.
- [١٢] D.Coric, M. I.Aljumah, E.F.Aboshoushah, A. M.Alaitan, A.A. A.Almulhim, N. M. AlOtaibi, & A.B.Alharthi, Assessment and Management of Pain in the Intensive Care Unit. The Egyptian Journal of Hospital Medicine.vol.٧٣(٤),pp.٦٤٣٩-٦٤٤٥,٢٠١٨.
- [١٣] R.Dawood, L.El-Sebai, Y. M.Salem, & R.A.Y.A. Hussein, Effect of implementing a protocol of nursing care on hemodialysis patients' safety outcomes. IOSR Journal of Nursing and Health Science.vol.٥(٥),pp.٣١-٤٣,٢٠١٦.
- [١٤] D.Dawson, D.Nicholson, & H S. ardy, Standard precautions and Infection Control Procedures and Guidelines. Available <https://www.dhs.wisconsin.gov/ic/precautions.htm>.accessd.vol.٨٨,pp١٢٢-١٥٠,٢٠١٨.
- [١٥] El neblawy, Effect of infection control guideline on knowledge and practice of health care workers caring for patients with hepatitis c. Thesis of doctorate, faculty of nursing, El Mansora University.vol.٨٥,pp١٤٤-١٦٠,٢٠١٨.
- [١٦] W.Elغاز, M.M.Raghep, H.Mohamed, & R.Mohamed, Effects of an Educational Program on the Nurses' performance regarding Vascular Access Infection Prevention. Thesis for doctoral degree in nursing science, Medical Surgical Nursing, Faculty of Nursing, Benha University.vol.٦٦,pp.٧٦-٨٠,٢٠٢٠.
- [١٧] S.El-Gendi, H.Seung, S.M.Abdelsamie, A.A.Feemster: Assessment of Patient Safety Culture among Egyptian Healthcare Employees. Med Saf Glob Health.vol.٦,pp.١٣٤-١٥٠,٢٠١٧.
- [١٨] N. M.Fayed, T.Hanan, T. H.Elbahnasawy, & K.T.Omar, Effect of Instructional program on nurses compliance with Universal precautions of infection control. International Journal of Novel Research in Healthcare and Nursing.vol.٣(١),pp.٨١-٩٢,٢٠١٦.

- [١٩] E.Fleming, D.Martin,: Children & Young People's Nursing Skills at a Glance, Wiley Blackwell.vol.٣٩,pp.٦٠-٩٠,٢٠١٨.
- [٢٠] N.A.Floyd, Effectiveness of Pressure Ulcer Protocols with the Braden Scale for Elderly Patients in the Intensive Care Unit: A Systematic Review (Doctoral dissertation, Walden University.vol.٦,pp٦٩-٨٩,٢٠١٨.
- [٢١] S.Gaspar, M.Peralta, A.Marques, A.Budri, & M.Gaspar de Matos, Effectiveness on hospital-acquired pressure ulcers prevention: a systematic review. International wound journal.vol.١٦(٥),pp.١٠٨٧-١١٠٢,٢٠١٩.
- [٢٢] B.Grešš Halász, A.Béřešová, E.Tkáčová, D.Magurová, & E.Lizáková, Nurses' Knowledge and Attitudes towards Prevention of Pressure Ulcers. International Journal of Environmental Research and Public Health.vol.١٨(٤),pp.١٧٠٥-١٧٢٠,٢٠٢١.
- [٢٣] A.Gundlapalli, M.Jalent, & D.Zhao, precision health care through informatics (١st ed.). International medical informatics association and ios press, Netherland.vol.٥,PP.١٢٢-١٢٣,٢٠١٨.
- [٢٤] H. M. M.Hanan Mohammed Mohammed, & D.Abdallah, MEDICATION ERRORS IN CRITICAL CARE UNIT. Mansoura Nursing Journal.vol.٥(١),pp.٢١٢-٢١٥,٢٠١٨.
- [٢٥] H.Hassanin, Entitil for' nurses performance regarding the neurological assessment in neurological unit, Page.vol.٥٠,pp٥٥-٨٨,٢٠١٦.
- [٢٦] B. M.Ismail, & M. NasirPatient Safety and Its Components. Journal of Patient Safety & Quality Improvement.vol.٥(٤),pp.٥٩٢-٥٩٣,٢٠١٧.
- [٢٧] JCI Joint Commission International purpose. Available at: <http://www.jointcommissioninternational.org/> (last accessed.vol.٦,pp.٧١-٧٩,٢٠١٦.
- [٢٨] N.Kandeel, & N.Tantawy,: Current Nursing Practice for Prevention of Ventilator Associated Pneumonia in ICUs, Life Science Journal.vol.٩(٣),pp.٩٨٦-٩٧٠,٢٠١٤.
- [٢٩] B.King, K.Pecanac, A.Krupp, D.Liebzeit, & J. Mahoney, Impact of fall prevention on nurses and care of fall risk patients. The Gerontologist.vol.٥٨(٧),pp.٢٣١-٢٤٠,٢٠١٨.
- [٣٠] S. L.Lewis, L.Bucher, M. M.Heitkemper, M. M.Harding, J. Kwong, & D.Roberts, Medical-Surgical Nursing-E-Book: Assessment and Management of Clinical Problems, Single Volume. Elsevier Health Sciences.vol.٤١,pp٢٣٠-٢٥٠,٢٠١٦.
- [٣١] W.Mahmood, & K.Khudur.Assessment of Nurses' Knowledge toward Vascular Access Devices for Patients with Hemodialysis at Baghdad, Journal of Nursing and Health Science .vol.٥(٥),pp.٦٩-٨٠, ٢٠١٦.
- [٣٢] E. A. E. N.Mahmoud, O.A.E.G.EL-shafie, & M. A. Abdel-Aziz,Effect of Educational Program for Nurses Performance Regarding Infection Control Precautions, toward patient on Mechanical Ventilation. Assiut Scientific Nursing Journal.vol.٨(٢٠),pp.٩٤-١٠٤,٢٠٢٠.
- [٣٣] S.M.A.Majeed, Effectiveness of planned teaching programme on knowledge and practice of endotracheal suctioning among staff nurses in selected hospitals of Mangalore. Asian Journal of Nursing Education and Research.vol.٣(٤),pp.٢٤٣-٢٤٧,٢٠١٣.
- [٣٤] E.A.Mamdouh, , H.S.Mohamed, & D.A.Abdelatief, Assessment of Nurses' Performance Regarding the Implementation of Patient Safety Measures in Intensive Care Units.vol.٨٨,pp.١٢٣-١٤٥,٢٠٢٠.
- [٣٥] J. C.Marshall, L.Bosco, N.K.Adhikari, B.Connolly, J.V.Diaz, T.Dorman, & J.Zimmerman, What is an intensive care unit? A report of the task force of the World Federation of Societies of Intensive and Critical Care Medicine. Journal of critical care.vol.٣٧,pp.٢٧٠-٢٧٦,٢٠١٧.
- [٣٦] J. A.McCutcheon & G.R.Doyle Clinical Procedures for Safer Patient Care. recent edition, Victoria, British Columbia Institute of Technology, .vol. ٣٠,pp. ٥٨٩-٥٩٨,٢٠١٨.
- [٣٧] Mohamed, S. A., & Weheida, S. M. (٢٠١٥). Effects of implementing educational program about pressure ulcer control on nurses' knowledge and safety of immobilized patients. Journal of nursing education and practice, ٥(٣), ١٢ .

- [٣٨]Mohamed, S. S., & Ibraheem, R. A. (٢٠١٩). Effect of Preventive Bundle Care on Nurses' Knowledge, Compliance and Patients' Outcome Regarding Pressure Ulcer in the Intensive Care Unit. Evidence-Based Nursing Research, ١(٤), ١٢-١٢.
- [٣٩]Mohammed, A., Othman, W., & Shereif, W. (٢٠١٨). EFFECT OF NURSING CARE GUIDELINES FOR PRESSURE ULCERS PREVENTION TO ORTHOPEDIC IMMOBILIZED PATIENTS. Mansoura Nursing Journal, ٥(١), ٥٥-٦٥.
- [٤٠]Mohammed, M. A., Abdel-Aziz, M. A., & Soliman, M. S. S. (٢٠٢٠). Effect of implementing nursing care protocol about acute lung injury on patients' outcomes.
- [٤١]Montejano-Lozoya, R., Miguel-Montoya, I., Gea-Caballero, V., Mármol-López, M. I., Ruíz-Hontangas, A., & Ortí-Lucas, R. (٢٠٢٠). Impact of Nurses' Intervention in the Prevention of Falls in Hospitalized Patients. International Journal of Environmental Research and Public Health, ١٧(١٧), ٦٠٤٨.
- [٤٢]Moursy, a., & Sharaf, a., (٢٠١٧). Vascular access care at hemodialysis unit; nurses' compliance to infection prevention and control practices Journal of Nursing and Health Science ٦ (٢):٦١-٦٩.
- [٤٣]Najafpour, Z., Godarzi, Z., Arab, M., & Yaseri, M. (٢٠١٩). Risk factors for falls in hospital in-patients: a prospective nested case control study. International journal of health policy and management, ٨(٥), ٣٠٠.
- [٤٤]Nasr, N.H., Ameen, N.F., Mohammed, M.A& Abd El hafiz,A.I.,(٢٠١٩). Effect of an Teaching Program on Critical Care Nurses's Performance About end of Life Care for Hepatic Patients, Assiut Scientific Nursing Journal, Vol , (٦) No , (١٤).
- [٤٥]Patient Safety Authority (٢٠١٥): Sample Policy: Correct Patient and Procedure Identification for Inpatient and Outpatient Radiology Services. Available at: <http://patientsafetyauthority.org/EducationalTools/PatientSafetyTools/upradiology/Documents/policy.pdf> (last accessed: ٨/١٢/٢٠١٦)
- [٤٦]Ragheb, S. E., & Metwally, F. G. (٢٠١٦). Effect of Training Program on Reduction of Nurse's Medication Errors. Zagazig Nursing Journal, ١٢(٢), ١١٦-١٢٣.
- [٤٧]Rivera-Izquierdo, M., del Carmen Valero-Ubierna, M., R-delAmo, J. L., Fernandez-Garcia, M. A., Martinez-Diz, S., Tahery-Mahmoud, A., ... & Jimenez-Mejias, E. (٢٠٢٠). Sociodemographic, clinical and laboratory factors on admission associated with COVID-١٩ mortality in hospitalized patients: A retrospective observational study. PLoS One, ١٥(٦), e٠٢٣٥١٠٧.
- [٤٨]Saad Mahmoud, H., Abd Elkader Mohammed, L., Said Taha, A., & El Sayed Ghonaem, S. (٢٠٢١). Impact of Educational Program for Hepatic Encephalopathy on Nurses Performance and Patients Outcomes. Journal of Nursing Science Benha University, ٢(٢), ١٩٠-٢٠٢.
- [٤٩]Said, A. (٢٠١٥): Knowledge and practice of intensive care nurses on prevention of ventilator associated pneumonia at Muhimbili national hospital, MSc Nursing (Critical Care and Trauma) Dissertation. Muhimbili University of Health and Allied Sciences J., Daressalaam, Tanzania, ٢٢(١): p.٣٣٢.
- [٥٠]Samad, Ola & Ahmed, Dr & Mohamed, Dr & Elhamied, Dr. (٢٠١٩). Effect of Training Program on Nurses' Performance Regarding Care for Patients under Mechanical Ventilator in Intensive Care Units.
- [٥١]Sayed S, Younis G and Al-Metyazidy H. (٢٠١٧): Effect of Shallow versus Deep Endotracheal Tube Suctioning on Hemodynamic Parameters in mechanically ventilated patients in Intensive Care Unit. (IOSRJNHS٢٠١٧; ٦(٤) ٢٨-٣٨.
- [٥٢]Seliman, A. M., Morsy, W. Y., Sultan, M. A., Elshamy, K. F., & Ahmed, H. H. E. (٢٠١٤). Impact of a designed head trauma nursing management protocol on critical care nurses' knowledge and practices at emergency hospital Mansoura University. Journal of American science, ١٠(١٢), ١٣-٢٥.
- [٥٣]Shehab, M., Ibrahim, N., & Abd-Elkader, H. (٢٠١٨). Impact of an educational program on nurses' knowledge and practice regarding care of traumatic brain injury patients

at intensive care unit at Suez Canal University Hospital. International Journal of Caring Sciences, ١١(٢), ١١٠-٤

- [٥٤] Vaismoradi, M. (٢٠١٧): Nursing education curriculum for improving patient safety. J Nurs Educ Pract; ٢(١):١٠١-٤.
- [٥٥] WHO. (٢٠١٩). Patient safety- Global action on patient safety. Report by the Director-General. Geneva: (https://apps.who.int/gb/ebwha/pdf_files/WHA٧٢/A٧٢_٢٦-en.pdf, accessed ٢٣ July ٢٠١٩.)
- [٥٦] Yilmaz, Z. & Goris, S. (٢٠١٥): Determination of the patient safety culture among nurses working at intensive care units. Pak J Med Sci; ٣١(٣):٥٩٧-٦٠١.