

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

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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. **Aim of study:** This study aimed 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:** This study was conducted at the general intensive care unit at Benha University Hospital. **Subjects:** Convenience sample of all available nurses (63 nurses) who are working in Intensive Care Unit (ICU) & a convenience sample of 60 consecutive eligible patients who attended to ICU within 6 months. **Tools of data collection:** Data of the present study was collected by using the following three tools. **I:** Structured Questionnaire for nurses. **II:** Patient safety practices observational checklist and **III:** Patients' safety outcomes checklist. **Results:** The post mean knowledge and practice scores of nurses regard patients' safety post nursing care protocol implementation were higher than pre implementation, there is a highly significant positive correlation between total nurses' knowledge and their practice at pre and post implementation of nursing care protocol where $p < 0.001$. **Conclusion:** There was an improvement in patient' safety outcomes for study group than control group after one week with statistically significance difference. **Recommendation:** 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.

Introduction

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. Patients contribute significantly to the burden of harm due to unsafe care. Available evidence suggests that hospitalizations in low- and middle-income countries lead to 134 million adverse events annually, contributing to 2.6 million deaths. Estimates indicate that in high-income countries, about 1 in 10 patients is harmed while receiving hospital care (World Health Organization, 2019).

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 (Joint Commission International, 2016).

Medication errors in critical care are frequent, serious, and predictable. Critically ill patients are prescribed twice as many medications as patients outside 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 (**Mohammed & Abdallah, 2018**).

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 (**Gundlapalli et al., 2018**).

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 (**Gaspar et al., 2019**).

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. Staff nurses may have the greatest impact on reducing patient falls. Due to their 24-hr presence, nurses have the most consistent contact with patients and continually monitor for conditional changes (**Najafpour et al., 2019**).

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 (**Bouldin et al., 2016**).

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).

Significance of the study:

Patients' safety is a global health concern, affecting patients in all health care settings, whether in developed or developing countries. Research studies have shown that an estimated average of 10% of all inpatient admissions result in a degree of unintended patient harm. It is estimated that up to 75% of these lapses in health care delivery are preventable. In addition to human suffering, unsafe health care exacts a heavy economic toll. Indeed, it is estimated that 5–10% of expenditure on health is due to unsafe practices that result in patient harm. Most of this is due to system failures rather than the actions of individuals (Elmontsri, Banarsee & Majeed, 2018).

Aim of the study

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

Research Hypothesis

H1- The mean score of nurses' knowledge post the nursing care protocol would be higher than mean score of nurses' knowledge pre protocol implementation.

H2-The mean score of nurses' practice post the nursing care protocol would be higher than mean score of nurses' practice pre protocol implementation.

H3-There would be improving in patients' safety outcomes post the nursing care protocol higher than pre protocol implementation.

Subject and Method

Research design

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

Setting

The study was conducted at 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.

Sample

a- Nurses

Convenience sample of all available nurses (63 nurses) who are working at ICU and are assigned for caring the patients were included in the study. They are willing to participate in the study.

b- Patients

Convenience sample of 60 consecutive eligible patients who attended to the above-mentioned setting within 6 months ago. The subjects were eligible in the study were adult patients from both sexes who are newly admitted not more than 48 hrs with stable condition and free from pressure ulcer. Subjects recruited were allocated and classified into two equal groups, 30 patients (control group) pre protocol who received care according to hospital routine and 30 patients (study group) post protocol who received nursing care protocol.

Tools for data collection

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

I: Structured Questionnaire for nurses

It was designed by the researcher through a review of related and recent literature, it was adapted from (Elgazar, et al, 2020; Burns et al, 2020; Fleming & Martin 2018; Aboelfetoh et al., 2017; Lewis, et al, 2016). It aimed to assess nurses' knowledge related to patients' safety. It comprised two parts:

Part 1: 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 2: Concerned with nurses' knowledge assessment. It consists of 6 parts as follow

- 1- Nurses' knowledge about patients' safety: it consists of 2 MCQ.
- 2- Medication errors: it consists of 23 MCQ
- 3- Infection prevention: it consists of 14 MCQ
- 4- Pressure ulcer prevention: it consists of 7 MCQ and 23 Yes or No questions about nursing care of pressure ulcer.
- 5- Fall prevention: it consists of 20 MCQ.
- 6- Pain management: it consists of 11 MCQ.
- 7- Nurses' knowledge about care of intubated patient: it consists of 19 MCQ.

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: 166 equal (100%)**
- Score from >80 referred to satisfactory knowledge.
- Score from 0-80 referred to unsatisfactory knowledge.

II: Patient safety practices observational checklist:

It was adapted from (Burns et al, 2020; Elgazar, et al, 2020; McCutcheon & Doyle, 2018; Floyd, 2018; Aboelfetoh et al., 2017) 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.

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 (1) 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.

Practice total score: 210 equal (100%)

- Score from >80 referred to competent practice.
- Score from 0-80 referred to incompetent practice.

III: Patients' safety outcomes checklist

This assessment sheet was developed by the researcher in English language after reviewing the related literature (Burns et al, 2020; Elgazar, et al, 2020; McCutcheon & Doyle, 2018; Floyd, 2018). It comprised four parts:

Part 1: Patients' socio-demographic characteristics will include: age, sex, medical history, diagnosis and duration of admission.

Part 2: This part concerned with assessed signs and symptoms of hospital acquired infection. It consists of three parts:

- 1- Laboratory investigation
- 2- General Signs and symptoms of infection
- 3- Local signs and symptoms of infection

Part 3: This part concerned with Physiological parameters for patient such as pulse, respiration, temperature, blood pressure and O₂ saturation.

Part 4: 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., (1987)** 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 1 (least impairment) to 4 (most impairment) except friction and shear, which rates from 1-3.

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- **Fall's risk assessment** which adapted from **Morse, Black & Oberle (1989)**. 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.

- **Critical pain assessment scale** or the Critical-Care Pain Observation Tool (CPOT) which adopted from **Gelinas, Fillion & Puntillo (2009)** 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 (0 to 2) with total score of 8 it was divided.

Nursing care protocol

This protocol was developed by the researcher in the form of Arabic booklet after reviewing related literature (**Elgazar, et al, 2020; Burns et al, 2020; Fleming & Martin 2018; Aboelfetoh et al., 2017; Lewis, et al, 2016**) 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.

Validity and reliability of tools:

The validity of the tools was ascertained by a group of five experts from medical surgical nursing department, faculty of Nursing, Benha University (one Professor, 2 assistant professors and 2 lecturer). Their opinions elicited regarding the format, consistency, accuracy, and relevancy of the

tools; necessary modification was done accordingly

Reliability was testing statistically to assure that the tools are reliable before data collection. Testing reliability of the developed tools was done through Alpha Cronbach test .

-Alpha Cronbach reliability analysis for structured interviewing questionnaire was 0.77

- For observational checklist regards patient's safety was 0.81

-Alpha Cronbach reliability analysis for Clinical risk assessment tool was 0.85

- For Critical pain assessment scale was 0.83

Pilot study:

After the tools have been designed, they were tested through a pilot study and excluded from the result, which was done before embarking on the field work to check the clarity and feasibility of designed tools and to estimate the time needed to complete its items. It was carried out on 10% of nurses (6) who are working at Intensive Care Unit to estimate the proper time required for answering the questionnaire and 10% of patients (6) who admitted to ICU, according to the result of the pilot study. Some modification was performed as needed.

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 in the study

and they have the right to withdraw from the study at any time.

Field of work:

The process of data collection and teaching sessions extended over 12 months and starting at August 2020 till the end of July 2021, it was carried out by the researcher through four phases: -

Assessment phase :

The researcher visited ICU department (three days weekly morning and afternoon) to collect data.

For nurses :

- The nurse's structured questionnaire was used to assess their knowledge regarding critical patients' safety to identify the nurses' educational needs. These tools were filled by the nurses; it had taken about 45-60 minutes to be filled.

- Nurses were observed by the researcher using observational checklists to assess their practice regarding 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. It had taken for 45 minutes for each nurse; this phase of nurse's assessment took one month.

For patients :

- Patients (control group) were observed by the researcher using patient assessment sheet to assess patients' safety outcomes. It had taken 45 minutes for every patient; this phase took 3 months.

Planning Phase (nursing care protocol development):

Proposed protocol general and specific objectives were designed based on predetermined subjects' need, relevant recent literature, and opinions of the nursing experts. This protocol was revised and modified based on the experts' comments, in

order to be implemented using various methods including a booklet contained major headlines of the nursing care protocol for critical patients' safety, which was designed by researcher, and written in a very simple Arabic language, as well as supplemented by photos.

Implementation phase :

- The implementation phase achieved through training sessions at period of 16 weeks. Nurses divided into groups each group contain 3 nurses, this phase took a period of 5 months in addition to one-month pre protocol baseline assessment and one-month post protocol evaluation taking into consideration the use of Arabic language that suits the levels of nurses. Motivation and reinforcement during training session used in order to enhance motivation for sharing in the study. The total number of sessions for each group of nurses was 7 sessions for knowledge & 6 sessions for practice with 45-60 minutes for every session including 10 minutes for discussion & feedback .

- Each session was started by a summary about what has been discussed in the previous session and the objectives of the new session, also, the session ended by a summary of its contents and feedback from the nurses was obtained to ensure that he/she got the maximum benefit.

- Teaching methods for knowledge were lecture and group discussion. Meanwhile, demonstration and redemonstration. were for practice.

- The media utilized were handouts, posters, videos & pictures.

- The content of training sessions covered in a booklet; each nurse obtained a copy of the Arabic booklet.

- At last sessions, the researcher informed them that they will be evaluated by the researcher immediately .

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Evaluation phase:

For nurses - :

Evaluation of the effect of the nursing care protocol on nurses' knowledge, practice was done by comparing the results pre and post immediately implementation of the protocol by using the same data collection tools (utilizing tool 1, 2). This phase took one month .

For patients - :

The researcher assessed patients (study group) using patients safety outcome checklist (utilizing tool 3). The evaluation performed on admission and after one week, this phase took 3 months.

Statistical analysis

Data were verified prior to entry into the computer. The Statistical Package for Social Sciences (SPSS version 20) 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 $p \leq 0.001$, while a significant level value was considered when $p \leq 0.05$, and insignificant when $p > 0.05$.

Results

Table (1): Reveals that, 50.8% of the studied nurses were in the age category 25-<35 years with the mean \pm SD 33.1 ± 2.31 , 71.4% were females and 82.5% were married. In relation to qualification, 57.2% had technical nursing institute and 69.8% were nurses. Regarding to years of experience, 55.6% had experience years from

5-<10 years and 81.0% hadn't attended any training courses related to patient safety in ICU.

Table (2): Shows that the mean score of total knowledge was 52.9 ± 15.20 pre nursing care protocol implementation, which improved to 132.5 ± 37.9 post nursing care protocol implementation. With highly statistically significant differences among all items pre and post nursing care protocol implementation at ($p \leq 0.001$).

Table (3): Demonstrates that, the total mean score of nurse's practices was 86.7 ± 23.5 pre nursing care protocol implementation. However, post implementation improved to 176.8 ± 40.1 . also, there were highly statistically significant difference between all items pre & post implementation at $p < 0.001$.

Table (4): 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 $p < 0.001$.

Table (5): Reveals that regarding age (43.3%, 40% respectively) of both control & study group their age was from 51->60 years old with mean \pm SD was (54.3 ± 10.8 & 53.7 ± 9.81 respectively), regarding gender (60%, 53.3% respectively) were males regarding medical history (40%, 33.3% respectively) of control & study group had hypertension and (26.7% & 23.3% respectively) of control & study group had history of previous ICU admission. Concerning diagnosis (26.7% & 30% respectively) of control & study group had brain hemorrhage and duration of hospital stay was one day with percentage (60% & 56.7% respectively) of both groups.

Table (6): Clarifies that (40%, 40% respectively) of both control and study group were at moderate risk on admission

with no significant difference between them. While after one week (26.7%, 50% respectively) of control and study group were at mild risk with highly statistically significant difference between both groups at $p \leq 0.001$.

Table (7): Clarifies that (46.7%, 40.7% respectively) of both control and study group were at moderate risk on admission with no significant difference between them. While after one week (26.7%, 40% respectively) of control and study group were at low risk with highly statistically significant difference between both groups at $p \leq 0.001$.

Table (8): Clarifies that (53.3%, 50% respectively) of both control and study group had moderate pain on admission with no significant difference between them. While after one week (20%, 33.3% respectively) of control and study group had mild pain with highly statistically significant difference between both groups at $p \leq 0.001$.

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Table (1): Number and percentage distribution of the studied nurses according to their socio-demographic characteristics (N=63)

Socio demographic characteristics	The studied sample (n=63)	
	N	%
Age (Year)		
< 25	10	15.9
25 - < 35	32	50.8
35 - < 45	15	23.8
45-55	6	9.5
Mean SD	33.1 ± 2.31	
Gender		
Male	18	28.6
Female	45	71.4
Marital Status		
Single	7	11.1
Married	52	82.5
Divorced	2	3.2
Widowed	2	3.2
Position		
Staff Nurse.	53	84.1
Head Nurse	10	15.9
Qualification		
A high school diploma in nursing	8	12.7
A technical nursing institute	36	57.2
A bachelor's degree in nursing	14	22.2
Postgraduate studies	5	7.9
Job Title		
A nursing specialist	9	14.3
Assistance nurse	44	69.8
Head nurse	10	15.9
Experience years		
< 5	12	19
5 - < 10	35	55.6
10 - < 15	8	12.7
15-< 20	5	7.9
≥ 20	3	4.8
Mean SD	11.69 ± 3.90	
Attended any training course related to the safety measures of critically ill patients		
Yes	12	19
No	51	81
If yes, When did you receive this training course(n=12)		
Less than one year	2	16.7
One year	3	25
Three years	7	58.3

Table (2): Comparison between total nurses' knowledge pre and post implementation of nursing care protocol (N=63)

Safety knowledge	The studied sample (n=63)								Chi square test	
	Pre nursing care protocol				Post nursing care protocol					
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory		X ²	p-value
	N	%	N	%	N	%	N	%		
Prevention of medication errors	26	41.3	37	58.7	54	85.7	9	14.3	41.55	.000**
Prevention of infection	24	38.1	39	61.9	52	82.5	11	17.5	36.87	.000**
Prevention of bed sores	18	28.6	45	71.4	50	79.4	13	20.6	40.58	.000**
Prevention of fall	25	39.7	38	60.3	54	85.7	9	14.3	37.68	.000**
Pain assessment	13	20.6	50	79.4	56	88.9	7	11.1	37.78	.000**
Care of intubated patient	16	25.4	47	74.6	55	87.3	8	12.7	32.91	.000**
Total	14	22.2	49	77.8	53	84.1	10	15.9	42.63	.000**
Mean SD	52.9±15.20				132.5±37.9					

(*) Statistically significant at p≤0.05. (**) highly statistically significant at p≤0.001.

Table (3): Comparison between total nurses' practice pre and post implementation of nursing care protocol (N=63)

Safety practice regarding	The studied sample (n=63)								Chi square test	
	Pre nursing care protocol				Post nursing care protocol					
	Competent		Incompetent		Competent		Incompetent		X ²	p-value
	N	%	N	%	N	%	N	%		
Medication administration	30	47.6	33	52.4	52	82.5	11	17.5	34.32	.001**
Medication error reporting	10	15.9	53	84.1	48	76.2	15	23.8	32.36	.000**
Infection control	24	38.1	39	61.9	52	82.5	11	17.5	31.95	.000**
Pressure ulcer prevention	14	22.2	49	77.8	50	79.4	13	20.6	34.78	.000**
Fall prevention	25	39.7	38	60.3	50	79.4	13	20.6	25.30	.000**
Pain management	12	19.5	51	80.5	54	85.7	9	14.3	29.84	.000**
Care of intubated patient	20	31.7	43	68.3	55	87.3	8	12.7	25.51	.000**
Total	16	25.4	47	74.6	50	79.4	13	20.6	33.08	.000**
Mean SD	86.7±23.5				176.8±40.1					

(**) highly statistically significant at p<0.001.

Table (4): Correlation between total nurses' knowledge and their practice pre and post implementation of nursing care protocol (N=63).

Variables		Total nurses' practice	
		Pre	Post
Total nurses' knowledge	r	0.563	0.541
	p	.000**	.000**

**highly significant at p < 0.001.

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Table (5): Number and percentage distribution of the studied patients (control and study group) according to their socio-demographic data.

Socio-Demographic Data	Control group (n=30)		Study group (n=30)		Test of Sig.	
	N	%	N	%	X ²	P-value
Age (year)					1.510	.241
30 – 40	3	10	2	6.7		
41 – 50	6	20	7	23.3		
51 – 60	13	43.3	12	40		
>60	8	26.7	9	30		
Mean SD	54.3 ± 10.8		53.7 ± 9.81		t=1.964	.209
Gender					1.467	.299
Male	18	60	16	53.3		
Female	12	40	14	46.7		
Medical history					1.210	.310
Hypertension	12	40	10	33.3		
Diabetes mellitus	6	20	8	26.7		
Cardiac disease	4	13.3	5	16.7		
Previous ICU admission	8	26.7	7	23.3		
Diagnosis					.992	1.017
Brain tumor	4	13.3	4	13.3		
Poly-trauma	5	16.7	6	20		
Heart failure	3	10	3	10		
Brain Hemorrhage	8	26.7	9	30		
Diabetic ketoacidosis	3	10	3	10		
Other	7	23.3	5	16.7		
Duration of hospital stay (Day)					1.037	.384
New admission	5	16.7	7	23.3		
One day	18	60	17	56.7		
Two days	7	23.3	6	20		

No significant at p >0.05.

Table (6): 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=30)				Study group (n=30)				Test of Sig. (p ₁)	Test of Sig. (p ₂)
	On admission		After one week		On admission		After one week			
	N	%	N	%	N	%	N	%		
No risk	4	13.3	5	16.7	2	6.7	7	23.3	X ² =1.347 P=.322	X ² =12.12 P=.000**
Mild risk	6	20	8	26.7	7	23.3	15	50		
Moderate risk	12	40	11	36.7	12	40	6	20		
Severe risk	8	26.7	6	20	9	30	2	6.7		

X²: Chi-square

p= p-value

P₁: p value for comparing between the (Control group and Study group) on admission.

P₂: p value for comparing between the (Control group and Study group) after one week.

** : Highly statistically significant at p ≤ 0.001. No significant at p >0.05.

Table (7): 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=30)				Study group (n=30)				Test of Sig. (p ₁)	Test of Sig. (p ₂)
	On admission		After one week		On admission		After one week			
	N	%	N	%	N	%	N	%		
Low risk	6	20	8	26.7	5	16.7	12	40	X ² = 1.119 P=.387	X ² =14.11 P=.000**
Moderate risk	14	46.7	12	40	14	46.7	11	36.7		
High risk	10	33.3	10	33.3	11	36.7	7	23.3		

X²: Chi-square

p= p-value

P₁: p value for comparing between the (Control group and Study group) on admission.

P₂: p value for comparing between the (Control group and Study group) after one week.

** : Highly statistically significant at p ≤ 0.001. No significant at p > 0.05.

Table (8): 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=30)				Study group (n=30)				Test of Sig. (p ₁)	Test of Sig. (p ₂)
	On admission		After one week		On admission		After one week			
	N	%	N	%	N	%	N	%		
No pain	2	6.7	2	6.7	2	6.7	4	13.3	X ² = 0.874 p=.900	X ² = 10.66 P=.003 **
Mild pain	4	13.3	6	20	3	10	10	33.3		
Moderate pain	16	53.3	15	50	15	50	12	40		
Severe pain	8	26.7	7	23.3	10	33.3	4	13.3		

t: t. test

p= p-value

P₁: p value for comparing between the (Control group) on admission and after one week.

P₂: p value for comparing between the (Study group) on admission and after one week.

** : Highly statistically significant at p ≤ 0.001. No significant at p > 0.05.

Discussion

Regarding to the socio demographic characteristics of intern-nurses, the findings of the present study revealed that more than half of studied nurses were at the age group between 25-<35 years old with mean ± SD 33.1 ± 2.31. This may 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 **Mamdouh et al., (2020)** 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 20-30 years.

In the present study, more than two thirds of the studied nurses were females. This may be due to the greatest fraction of the nurses in Egypt was females and may related

to the studying of nursing in Egyptian universities were exclusive for females only until few years ago. These findings are in consistent with **Hassanin, (2016)** who studied about "nurses' performance regarding the neurological assessment in neurological unit" reported that three quarters of the study subject were females. But it disagrees with **Alrubaiee, et al., (2017)** 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 (61.2%).

Regard to marital status, the result of the study reveals that, majority of the studied nurses were married. This finding is in agreement with, **Mahmood and Khudur (2016)** 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 finding shows that more than half of the study nurses had technical nursing institute, this is in the same line with **Mamdouh, et al., (2020)** who reported that nearly half of the study nurses had technical nursing institute. But this results disagrees with **El-Gendi et al., (2017)** in his study entitled "assessment of patient safety culture among Egyptian healthcare employees " showed that all ICU nurses had a bachelor's degree in nursing science.

Concerning years of experience, the current study finding showed that more than half of the studied nurses had 5-<10 years of experience, this explains that most of those nurses were newly graduated, young and tolerate the nature of the work. This result is in agreement with **Said, (2015)** 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 10 years.

Regard to past training courses about patient safety, the result of current study revealed that majority of nurses had not 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 **Ragheb, & Metwally (2016)** who conducted a study entitled "Effect of training program on reduction of nurse's medication errors" and stated that few of staff nurses attended training program about medication administration.

Regarding total nurses' knowledge at pre and post implementation of nursing care protocol. The current study result revealed 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 **Samad et al., (2019)** 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.

As regard to total nurses' practice at pre and post implementation of nursing care protocol. The current study result revealed 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 pre and post implementation.

This is supported by **Abdelmoaty et al., (2020)** who conduct their study to evaluate effect of training on nurses' knowledge and skills and revealed that there was a highly statistically significant difference between levels of acquired nurses' practices pre/post the interactive training. Moreover, this finding is in agreement with **Mahmoud, et al., (2020)** who concluded that there was a statistically significant difference between before and after an educational program for patient on mechanical ventilation regarding total nurses' practice scores. Adding, that adequate performance infection controls standard precautions, which increased after application of education.

This result of study is in the same line with study done by **Samad et al., (2019)** stated that 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

Regarding sociodemographic characteristics of studied patients, the current study revealed that nearly two fifths of both control & study group at age group from 51->60 years old with mean of age 54.3 ± 10.8 & 53.7 ± 9.81 , 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 **Aysha & Ahmed., (2019)** 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 40-<50 years.

This finding is in agreement with **Dawood, et al., (2016)** 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 $50 < 60$. According to **Mohamed & Ibraheem, (2019)** who reported that more than half of the control and study group in the age category between 50-<60 .

Regarding gender the current study revealed more than half of the studied patients (study and control group) were male. This result is consistent with **Rivera-Izquierdo, (2020)** who study about " Sociodemographic, clinical and laboratory factors on admission associated with COVID-19 mortality in hospitalized patients " who reported that slightly more than half of our patients were males. According to **Mohamed & Ibraheem, (2019)** who reported that more than half of studied patients in the control and study group were males.

Regarding medical history, the current study revealed 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 51>60 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.

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This finding is in agreement with **Saad, et al., (2021)** 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 **Mohamed & Ibraheem, (2019)** who reported that more than one quarter of studied patients in the control and study group had hypertension.

Regarding diagnosis, also the current study revealed 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 $p > 0.05$ which indicated the two groups were nearly homogenous.

This finding is in the line with **Mohamed & Ibraheem, (2019)** 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 clarified that two fifth of both control and study group were at moderate risk on admission with no significant difference between them was found. 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 $p \leq 0.001$. This finding is in the line with **Mohamed & Ibraheem, (2019)** 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 **Mohammed, et al., (2018)** whose study indicated that, there was significant difference between the study and control groups on the 3rd day, and high significant difference at the 7th day related to risk assessment by Braden scale was found. Also, this finding is in agreement with **Atyea, et al., (2013)** whose study indicated that, on the day of admission, there was no significant difference between the study and control groups related to risk assessment was noted, but there was significant difference at 2nd to 4th day. There was moderate significant difference at 5th to 6th day then there was highly significant difference at 7th day.

This finding is in the line with **Mohamed & Weheida, (2015)** who reported that 80% 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 was represented a 30% 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 high statistically significant difference between both groups at $p \leq 0.001$.

This finding is in agreement with **Montejano-Lozoya et al., (2020)** 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 $p \leq 0.001$.

This result agrees with **Georgiou et al., (2019)** in his study entitled "The effectiveness of systematic pain assessment on critically ill patient outcomes: A randomized controlled trial" stated that The incidence of pain according to total critical pain assessment scale in the intervention group was significantly lower compared to the control group ($p < .001$). These findings are supporting the third research hypothesis

At the same line study done by **Nasr et al., (2019)** 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.

Conclusion

- The total mean score of nurses' knowledge was more improve after implementation of nursing care protocol than pre implementation. With highly statistically significant differences among all items pre

and post nursing care protocol implementation was found ($p \leq 0.001$).

- The total mean score of nurses' practice was more improve 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 was a high 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 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.

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تأثير تطبيق بروتوكول الرعاية التمريضية على نتائج سلامة المرضى الحرجة

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تعتبر سلامة المرضى من المبادئ الأساسية في جميع أماكن الرعاية الصحية. ومع ذلك ، لا تزال الأحداث السلبية والأخطاء والمخاطر المرتبطة بالرعاية الصحية التي يمكن تجنبها تشكل تحديات رئيسية لسلامة المرضى على مستوى العالم. لذا هدفت هذه الدراسة إلى تقييم تأثير تطبيق بروتوكول الرعاية التمريضية على نتائج سلامة المرضى الحرجة. وقد أجريت هذه الدراسة في وحدة العناية المركزة العامة بمستشفى جامعة بنها. على عينة مائة مائة لجميع الممرضات المتوفرين (٦٣ ممرضاً) الذين يعملون في وحدة العناية المركزة وعينة مائة من ٦٠ مريضاً مؤهلاً متتاليًا حضروا إلى وحدة العناية المركزة في غضون ٦ أشهر. حيث خلصت الدراسة بتحسين أكبر في نتائج سلامة المريض لمجموعة الدراسة مقارنة بمجموعة المراقبة بعد أسبوع واحد مع وجود فرق مهم إحصائياً & هناك علاقة إيجابية ذات دلالة إحصائية بين المعرفة الإجمالية للممرضات وممارستهم قبل وبعد تنفيذ بروتوكول الرعاية التمريضية حيث $p < 0.001$. كما أوصت الدراسة بتوفير التعليم أثناء الخدمة في المستشفى لتحسين أداء الممرضات فيما يتعلق بتدابير سلامة المرضى من خلال اكتساب المعرفة وتنفيذ معايير الرعاية المعمول بها والتي يجب تحديثها بشكل دوري.