The Effect of Nurses' Compliance to Evidence Based Guidelines on Pressure Ulcers Prevention for Critical Patients

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Abstract

Critically ill patients are among the most vulnerable groups that exposed to pressure ulcer because of limited physical activity. **Aim:** To evaluate the effect of nurses' compliance to evidence-based guidelines on pressure ulcers prevention for critical patients. **Design:** A Quesi experimental research design (pre- and post-test). **Sample:** A purposive sample of (55) nurses who agreed to participate in the study. **Setting:** The study was carried out at four intensive care units (Cardiothoracic, Neurological, Urology, and Trauma) that were affiliated to Minia University Hospital. **Tools:** Two tools were used for data collection prepared by the researcher. **First tool**: **Structured questionnaire sheet,** includes two parts, **1st Part:** Nurses' structured interview sheet about socio-demographic data, **2nd Part:** Knowledge Assessment Questionnaire Sheet about pressure ulcer. **Second tool**: **Pressure ulcer guidelines checklist for practice** covered the following items regarding PUs (Maintenance of skin integrity, Skin care and prevention of urinary incontinence). **Results**: Nurses' knowledge and practice were statistically significance difference at the pre-test (before education three months) which lead to low compliance and at I (post-test) and II (follow-up) (after three months from education) that improve nurses' compliance presented by P value (0.000). **Conclusion:** nurses' knowledge and practice improved after receiving education about the evidence based guidelines and their compliance was improved at the post-test I and II. **Recommendation:** continuous education and training sessions for all nurses working at different intensive care units about pressure ulcer preventive guidelines to improve their knowledge and compliance.

Key words: Nurses, Compliance, Evidence Based Guidelines, Pressure Ulcer, Critical Patients.

Introduction

Pressure ulcer (PU) is localized damage to the skin or underlying soft tissue, usually over a bony prominence or related to a medical device or other equipment. Moreover, PU can present as intact skin or an open injury and may be painful. Such injuries occur as a result of intense and/or prolonged pressure or pressure in combination with shearing forces **(Mohamed, Abd Elaziz,, & Elaasar, 2019).** The prevalence and incidence rates of individuals in the intensive care unit (ICU) are normally higher than those of other patients. Patients in the ICU are especially vulnerable to pressure ulcers (PUs) due to the complex conditions. The most prominent of many causative and confusing conditions is reduced mobility. Devices employed in the ICU, including respiratory devices, urinary/fecal collection devices, nasogastric and feeding tubes, vein and arterial lines, blood pressure cuffs, and compression stockings, also increase the risk of PUs **(Li, Zhu, & Liu, 2023).**

Interventions to prevent PUs play a pivotal role on early identification of patients at risk to develop lesions and nurses' knowledge of PU prevention is crucial to evaluate, treat risk factors, and mediates preventive care. An evidence-based guideline (EBG) is a set of recommendations which gathers the best evidence possible on the subject as its principal aim. It helps the working methods to be "effective, meaningful, and safe for the patient, and cost-effective for both the patient and society **(Taylor, Mulligan, & McGraw, 2021).**

Guidelines of pressure ulcer prevention have their basis in the evidence-based nursing care. PUs guidelines are considered important evidence-based knowledge's tools in guiding the care process on healthcare institutions. Evidence suggests that adequate nurses' knowledge and positive attitudes toward PU prevention are positively associated with evidence based compliance (**Azhar, Sharoni, & Fauzi 2020)**.

Nurses play an important role in evaluating and managing PUs they evaluate the PU risk at the patient's admission and perform preventive care that includes regular skin assessments, changing patient position, and mattress use for the group at highest risk of PU. Most nurses also perform primary care, such as assessment and dressing of PUs, in consultation with doctors, although certain hospitals have dedicated wound care nurses who have been systematically and professionally educated regarding PU management **(Taylor, Mulligan, & McGraw, 2021).**

Studies have shown that many nurses are unable to identify PU prevention protocols, reduce the amount of pressure on tissue or classify and assess PU risk **(Parisod, Holopainen, & Koivunen 2022)**.

Significance of the study

Pressure ulcer has an incidence in United States American (USA) is (10.4%) to (41%), (**Bavaresco, Lucena,2018).** Prevalence of pressure ulcers in Egyptian ICU was 33 %, and the prevalence of PUs when excluding stage one was 7.3% **(Qaddumi & AL Mahmoud, 2019).** In ICU in Mania university hospital PUs are about (13%) as the researcher observation of the renal ICU at the period from 2019:2020, so the researcher suspected that the other ICUs have higher incidence of pressure ulcer because of the longer stay. So, this study will be carried out to evaluate the nurse's compliance with pressure ulcer evidence based guidelines in the intensive care units among critically ill patients after education by researcher.

Subjects and Methods

The aim of the study

To evaluate the effect of nurses' compliance with evidence-based guidelines on pressure ulcer prevention for critical patients.

Research Hypothesis

- Nurses' knowledge about pressure ulcers for critical patients will improve after they will be educated by an evidence-based guidelines.
- Nursing's compliance to pressure ulcers care will improve after they follow the evidence-based guidelines.

Operational definition

Pressure ulcers are skin or soft tissue injuries that form due to prolonged pressure exerted over specific areas of the body **(Zaidi & Sharma, 2022).**

Evidence-based guide lines is defined as a problem-solving and decision-making approach in practice that involves the conscientious use of current best (research) evidence, clinical expertise, and patient preferences. Evidence-based practice involves the critical appraisal of information used to answer a clinical question. **(Cook, et al. 2020 & Waite & Killian, 2010).**

Compliance healthcare compliance refers to the systematic adherence to rules, regulations, and laws that pertain to practices within the healthcare industry **(Cook, et al. 2020 & Waite & Killian, 2010).**

Study Design:

A Quesi experimental research design (pre- and post-test) was utilized in the current study.

Setting:

The current study was carried out at four intensive care units that were affiliated with Minia University Hospital.

Subjects:

A purposive sample of all available nurses (55) who were on duty and agreed to participate in the study, who were working in intensive care units at Minia University hospitals, and they were distributed as follows:

N	Unit Name	Number of Nurses
1	Cardiothoracic Intensive Care Unit	15
2	Neurosurgical Intensive Care Unit	8
3	Urology Intensive Care Unit	8
4	Trauma Intensive Care Unit	24
Total		55

Inclusion criteria

All nurses agreed to participate in the study.

Study Duration

The data were collected during the period from February 2021 to May 2021.

Tools used in collecting data for this study

Two tools were designed and used to collect data for this study. The researcher prepared and tested these tools after an extensive literature review.

The first tool, "Structured questionnaire sheet," created by the researcher after reviewing the related literature (Ebi, et al 2019 & Cramer, et al. 2019) the tool consists of two parts:

1st Part: Nurses' structured interview sheet that was used to collect nurses' socio-demographic data related to age, gender, and marital status, place of residence, years of experience, qualifications, and the name of the critical care unit.

2nd Part: Knowledge Assessment Questionnaire Sheet used to assess nurses' knowledge about pressure ulcers and their preventive guidelines.

It was a multiple-choice questionnaire sheet, and it was translated into Arabic. It included twenty-six (26) questions reflecting the following items: definition, classification, and causes; manifestations; stages; and method of assessment. Finally, how to reduce pressure ulcers, nursing roles, and suitable positions to reduce their occurrence.

Scoring System:

Each answer was given a score of one, and the wrong answer was given a score of zero, for a total score of 26, so (< 60%) was considered unsatisfactory and (≥ 60) was considered satisfactory.

Second Tool: "Pressure ulcer guidelines checklist for practice

"Adopted from (Moon, 2015 & Sabaq, & Amer, 2018). This tool consisted of twenty-four items used to evaluate the ICU nurses' compliance with evidence-based guidelines (EBG) for pressure ulcer prevention for critically ill patients in different critical care units. It covered the following items:

Guideline check lists:-

- Maintenance of skin integrity (items 1–11)
- Skincare (items from 12–14)and Patient position (items from 15–17)
- Urinary incontinence prevention and care (items from 18–24)

Scoring system: the correctly done step scored one, but the incorrectly done or neglected step at all scored zero. The total score is 24. If the total score was (equals to or more than 75%), it was considered satisfactory (good practice scores), and (if its less than 75%) was unsatisfactorily considered (poor practice scores).

Tools validity:

The study tools were developed after reviewing the related literature. To determine content and face validity, these tools were tested by a jury committee consisting of five medical-surgical nursing experts. Recommendations were followed, and the needed clarification and modifications were made.

Tools reliability

Tools were tested for content reliability using Cronbach's alpha test. It was (0.81) for the first tool and (0.79) for the second tool.

Pilot study

A pilot study was carried out on six nurses working in the critical care units who fulfilled the inclusion criteria to test

the feasibility, objectivity, and applicability of the study tools and to estimate the needed time to complete the data collection. Based on the results of the pilot study, no refinements or modifications were made to the data collection tools.

Ethical Considerations

Official permission to conduct the study was obtained from Minia University, Faculty of Nursing ethical committee code number (REC202024A), dean of the faculty of nursing, ethical committee of research, research center afflicted to Egypt Ministry of Health, agreement from Egypt academics for the research center and technology, and from the director of critical care units at Minia University Hospital. Nurses' participation in this study was voluntary; they were informed about the study's aim, and had the right to withdraw from it at any time without any rationale. The obtained data confidential and would not be included in any further research without a second consent.

- Duration of study: The data were collected during the period from February 2021 to May 2021.

Procedure

The current study was achieved through three phases: the assessment phase (including the pre-test), the implementation phase (including conducting an educational guidelines), and the evaluation phase (including the I post-test immediately after finishing the education and II post-test after three months).

The assessment phase

Once official permission was granted, the assessment phase collected data over four weeks to test nurses' actual level of knowledge and practice about PU preventive guidelines. Data collection started over three days per week (from Saturday to Tuesday) on the morning shift and (Sunday) on the evening shift.

- During the assessment, the researcher held the first meeting with nurses to introduce herself and give an explanation about the nature, purpose, duration, and activities of the study.
- After obtaining acceptance from nurses to participate in the current study, the investigator assessed the nurses' socio-demographic data during a personal interview in their units **(1st part of the first tool).** After that, the investigator introduced the knowledge-assessment questionnaire **(2nd part of the first tool),** which was distributed to each nurse to assess their base knowledge level about pressure ulcers and their preventive guidelines. The questionnaire took about 45 minutes to be completed by each ICU nurse.
- The investigator assessed the nurses included in the study for their performance of skin care and routine activities to reduce the occurrence of pressure ulcers using the **second tool**. Each nurse was actually observed during their shifts at the ICU (in the morning and evening shifts).

The implementation phase

- The total sample (55) was divided into 11 small groups. Each group consists of five nurses. Each group received four sessions: two for enhancing their knowledge about pressure ulcers and the preventive guidelines to reduce it for critical patients, and another two about the ideal skin care performance according to the guidelines for reducing PU.
- The duration of each session was 45 to 60 minutes.
- The first session of the education program included the definition of a PU, its causes, risk factors, stages, manifestations, and diagnostic measures.
- The second session included treatment of PUs, nursing intervention, and preventive guidelines to reduce PUs, which include how to maintain skin integrity, patient position, nursing intervention for urinary incontinence, and pressure ulcer care
- In the third session, the researcher provides the ICU nurses with a demonstration and re-demonstration of the guidelines steps of skin care, message and the ideal patient's position every 2 hours
- In the fourth session, the researcher provided the ICU nurses with the nursing intervention to reduce urinary incontinence and the PU guidelines according to the checklist.
- The researcher allowed the nurses to practice all steps in PU prevention guidelines, asking questions, discussing every part presented, and reaching a high level of understanding during each session.
- ICU nurses included in the study received a brochure as a guide to help them remember the knowledge and practice included in the EBG program.

Evaluation phase

Times of evaluation were done for each nurse:

- The first evaluation (immediate post-test) is done immediately after the end of the educational guidelines.
- The second evaluation (II post-test) was done 3 months after the end of the educational guidelines

Statistical analysis of data

The collected data were organized, tabulated, categorized, and analyzed, and data entry was performed using the Statistical Package of Social Science (SPSS) version 20. Descriptive statistics were applied (e.g., mean, standard deviation, frequency, and percentage). Pearson's correlation coefficient was applied between quantitative variables. A significant level value was considered when $p<0.05$. The smaller the p-value obtained, the more significant the result (*); less than 0.001 was considered highly significant (**). The P-value is the probability of error of the conclusion.

Results

Table 1: Frequency and Percentage Distribution of the Socio-demographic data of Critical Care Unit Nurses' Staff (n = 55)

Item	Number	%
Age		
Less than 25	35	63.6
25-30	19	34.5
31-35	1	1.8
Gender		
Male	31	56.4
Female	24	43.6
Marital Status		
Single	37	67.3
Married	17	30.9
Others	1	1.8
Place of Residence		
City	17	30.9
Village	38	69.1
Years of Experience		
1-5 Years	42	76.4
6-10 Years	12	21.8
11-15 Years	1	1.8
Qualifications		
Diploma	3	5.5
Technical Institute	47	85.5
Bachelor	5	9.1

Table 1 shows that 63.6% of the ICU nurses ages are less than 25 years, and 34.5%' ages are between 25 to 30 years. Regarding sex, 56.4% of the ICU nurses were male. The technical institute degree comprised 85.5%. .

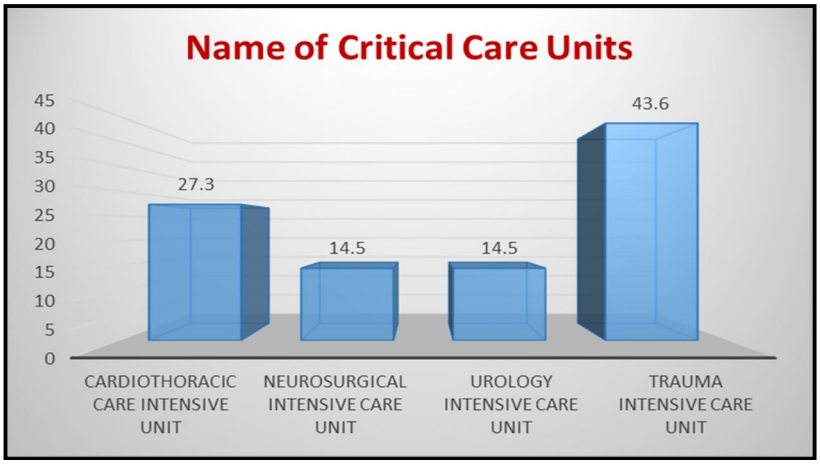

Figure 1: showed the names of the ICUs included in the study and it was observed that 43.6 % of the ICU nurses were working in the trauma ICU.

Table 2: Frequency Distribution of Critical Care Nurses Staff General Knowledge about Pressure Ulcer (n = 55)

Question	Pre Test		Post Test		Follow UP		P value
	Correct N (%)	Incorrect N (%)	Correct N (%)	Incorrect N (%)	Correct N (%)	Incorrect N (%)	
Skin definition	52 (94.5)	3 (5.5)	55 (100)	-	53 (96.4)	2 (3.6)	0.24
Skin layers	40 (72.7)	15 (27.3)	54 (98.2)	1 (1.8)	51 (92.7)	4 (7.3)	0.042
Skin importance	41 (74.5)	14 (25.5)	48 (87.3)	7 (12.7)	52 (94.5)	3 (5.5)	0.002
Pressure ulcer definition	46 (83.6)	9 (16.4)	51 (92.7)	4 (7.3)	47 (85.5)	8 (14.5)	0.001
Pressure ulcer classification	30 (54.5)	25 (45.5)	47 (85.5)	8 (41.5)	40 (72.7)	15 (27.3)	0.022
Pressure ulcer causes	22 (40)	33 (60)	48 (87.3)	7 (12.7)	39 (70.9)	16 (29.1)	0.001
Assessing patients with pressure ulcer	38 (69.1)	17 (30.9)	51 (92.7)	4 (7.3)	49 (89.1)	6 (10.9)	0.002
Pressure ulcer Stages	51 (92.7)	4 (7.3)	54 (98.2)	1 (1.8)	54 (98.2)	1 (1.8)	0.62
Pressure ulcer Sites	36 (65.5)	19 (34.5)	50 (90.9)	5 (9.1)	47 (85.5)	8 (14.5)	0.041

Table 2 shows the distribution of critical care nurses' general knowledge about PUs. It was found that 45.5% of the ICU nurses had an incorrect answer about the classification of pressure ulcers at the pre-test before EBG, but after it, 85.5 and 72.7%, respectively, had a correct answer at the post-test and follow-up. On the other hand, 60% of them did not know the correct causes of pressure ulcers. But 87.3 and 70.9%, respectively, had correct answers. Also, 34.5% did not correctly answer the question concerned with the sites of PUs, but 90.9% and 85.8%, respectively, answered this question correctly after the EBG.

Table 3: Distribution of Critical Care Nurse Staff Knowledge of Pressure Ulcer Manifestations (n = 55) (continued)

Question	Pre Test		Post Test		Follow UP		P value
	Correct N (%)	Incorrect N (%)	Correct N (%)	Incorrect N (%)	Correct N (%)	Incorrect N (%)	
Pressure ulcer symptoms	50 (90.9)	5 (9.1)	55 (100)	-	52 (94.5)	3 (5.5)	0.64
Stage the skin still health	46 (83.6)	9 (16.4)	54 (98.2)	1 (1.8)	49 (89.1)	6 (10.9)	0.44
Redness present in stage what of pressure ulcer	46 (83.6)	9 (16.4)	53 (96.4)	2 (3.6)	54 (98.2)	1 (1.8)	0.51
Most of skin layers that lost during PUs	30 (54.5)	25 (45.5)	45 (81.8)	10 (18.2)	40 (72.7)	15 (27.3)	0.023
All skin layers are lost?	18 (32.7)	37 (67.3)	39 (70.9)	16 (29)	32 (58.2)	23 (41.8)	0.045
Characteristics of the third stage of pressure ulcer	13 (23.6)	42 (76.4)	32 (58.2)	23 (41.8)	29 (52.7)	26 (47.3)	0.022
Characteristics of The fourth stage of pressure ulcer	46 (83.6)	9 (16.4)	54 (98.2)	1 (1.8)	53 (96.4)	2 (3.6)	0.58
First sign of infected pressure ulcer	31 (56.4)	24 (43.6)	54 (98.2)	1 (1.8)	48 (87.3)	7 (12.7)	0.002
Systemic manifestations of infected pressure ulcer	35 (63.6)	20 (36.4)	48 (87.3)	7 (12.7)	47 (85.5)	8 (14.5)	0.72
Complications of pressure ulcer	18 (32.7)	37 (67.3)	40 (72.7)	15 (27.3)	38 (69.1)	17 (30.9)	0.041

Table 3 depicts the distribution of critical care nurses' general knowledge about pressure ulcer manifestations. It was discovered that ICU nurses had incorrect answers to questions n13 and 14 at the pre-test before the education, but after the education, 81.8% and 72.7%, respectively answered it correctly, and 70.9% and 58.2%, respectively, had correct answers to the same questions at the post-test and follow-up. The question n15 was correctly answered by 58.2% and 52.7%, respectively, at the post-test and follow-up.

Table 4: Frequency Distribution of Critical Care Nurses Staff Knowledge about Management of Pressure Ulcer (n = 55) (continued)

Question	Pre Test		Post Test		Follow UP		
	Correct N (%)	Incorrect N (%)	Correct N (%)	Incorrect N (%)	Correct N (%)	Incorrect N (%)	
Measures to reduce pressure ulcer	51 (92.7)	4 (7.3)	53 (96.4)	2 (3.6)	52 (94.5)	3 (5.5)	
Pressure ulcer Nutrition	15 (27.3)	40 (72.7)	34 (61.8)	21 (38.2)	27 (49.1)	28 (50.9)	0.042
Pressure ulcer Suitable position	31 (56.4)	24 (43.6)	51 (92.7)	4 (7.3)	44 (80)	11 (20)	0.004
Pressure ulcer radiological studies	27 (49.1)	28 (50.9)	33 (60)	22 (40)	35 (63.6)	20 (63.4)	0.042
Pressure ulcer Nursing care	46 (83.6)	9 (16.4)	55 (100)	-	54 (98.2)	1 (1.8)	0.672
Management of pressure ulcer	44 (80)	11 (20)	54 (98.2)	1 (1.8)	47 (85.5)	8 (14.5)	0.051
Uses of debridement in pressure ulcer	44 (80)	11(20)	53 (96.4)	2 (3.6)	49 (89.1)	6 (10.9)	0.821

Table 4 displays the distribution of critical care nurses' staff general knowledge about the management of pressure ulcers. It was discovered that 72.7% of the ICU nurses did not know the ideal diet to reduce pressure ulcers (Q n21) at the pre-test before the education, but after the education, 61.8% and 49.1%, respectively, had answered correctly at the post-test and follow-up. On the other hand 80% of the ICU nurses had correct answer at the pre-test about Q n 26 which describe debridement as management for PU which also increased to 96.4% and 89.1% respectively at the post and follow up test.

Table 5: Nurses performance of maintaining skin integrity before and after the education about the evidence-based guidelines (n 55)

Item Maintaining of skin integrity	Pre Test		Post Test		Follow UP		P. value
	Done N (%)	Not don N (%)	Done N (%)	Not don N (%)	Done N (%)	Not don N (%)	
1- Keep skin free of excess moisture.	45 (81.8)	10 (18.1)	50 (90.9)	5 (9)	51 (92.7)	4 (7.27)	0.15
2- Cleanse skin with non-alkaline soap.	40 (72.7)	15 (27.2)	52 (94.5)	3 (5.4)	52 (94.5)	3 (5.4)	0.000
3- Provide daily cleansing of eyes, diaper or perinea areas.	50 (90.9)	5 (9)	53 (96.3)	2 (3.6)	53 (96.3)	2 (3.6)	0.34
4- Apply non-alcohol-based moisturizing agents after cleansing.	31 (56.3)	24 (43.6)	41 (74.5)	14 (25.4)	37 (67.2)	18 (32.7)	0.002
5- Use minimum amount of tape and adhesives.	38 (69)	17 (30.9)	46 (83.6)	9 (16.3)	46 (83.6)	9 (16.3)	0.98
6- Place pectin-based or hydrocolloid skin barriers directly over excoriated skin.	18 (32.7)	37 (67.2)	30 (54.5)	25 (45.4)	31 (56.3)	24 (43.6)	0.022
7- Eliminate pressure secondary to medical devices.	42 (76.3)	13 (23.6)	48 (87.2)	7 (12.7)	42 (76.3)	13 (23.6)	0.16
8- Use a draw sheet to move patient in bed or onto a stretcher.	44 (80)	11 (20)	48 (87.2)	7 (12.7)	45 (81.8)	10 (18.1)	0.57

Item Maintaining of skin integrity	Pre Test		Post Test		Follow UP		P. value
	Done N (%)	Not don N (%)	Done N (%)	Not don N (%)	Done N (%)	Not don N (%)	
9- Position in neutral alignment; pillows, cushions, or wedges may be needed.	43 (78.1)	12 (21.8)	44 (80)	11 (20)	47 (85.4)	8 (14.5)	0.59
10-Do not massage reddened bony prominences.	22 (40)	33 (60)	39 (70.9)	16 (29)	35 (63.6)	20 (36.3)	0.003
11-Routinely assess the patient's nutritional status.	44 (80)	11 (20)	37 (67.2)	18 (32.7)	39 (70.9)	16 (29)	0.30

Table 5 shows the nurses performance in maintaining skin integrity before and after the education about the EBG. It was found that 43.6% of the ICU nurses did not use non-alcohol-based moisturizing agents after cleansing the skin at the pre-test before the education, but after education about the EBG 74.5% and 67.2%, respectively did it at the post-test and follow-up and there was a statistical significance difference between them presented by the P value of 0.002.

Table 6: Frequency distribution of nurses' performance of pressure ulcer guidelines before and after the education (N = 55)

Item Skin care	Pre Test		Post Test		Follow UP		P. value
	Done N (%)	Not don N (%)	Done N (%)	Not don N (%)	Done N (%)	Not don N (%)	
12- Keep patients' skin clean and dry	46 (83.6)	9 (16.3)	46 (83.6)	9 (16.3)	46 (83.6)	9 (16.3)	1.0
13- Prophylactic dressings on bony prominences.	32 (58)	23 (41.8)	52 (94.5)	3 (5.4)	47 (85.4)	8 (14.5)	0.000
14- Don't position patients on areas of erythema	32 (58)	23 (41.8)	48 (87.2)	7 (12.7)	44 (80)	11 (20)	0.001
Patient position							
15- Reposition patients frequently (at least every 2 hours; every 30 minutes if the patient is immobile.	41 (74.5)	14 (25.4)	50 (90.9)	5 (9)	48 (87.2)	7 (12.7)	0.04
16- Keep the head of the bed at less than 30 degrees	38 (69)	17 (30.9)	48 (87.2)	7 (12.7)	48 (87.2)	7 (12.7)	0.02
17- When transferring patients, use shear-decreasing devices and size-appropriate equipment to facilitate ease of turning	38 (69)	17 (30.9)	47 (85.4)	8 (14.5)	43 (78.1)	12 (21.8)	0.11
Preventing urinary incontinence							
18- Cleanse the skin regularly	39 (70.9)	16 (29)	44 (80)	11 (20)	38 (69)	17 (30.9)	0.38
19- Provide perineal care at least every 2 hours by using perineal cleansers	34 (61.8)	21 (38.1)	46 (83.6)	9 (16.3)	43 (78.1)	12 (21.8)	0.24
20- Use a barrier cream	21 (38.1)	34 (61.8)	33 (60)	22 (40)	38 (69)	17 (30.9)	0.24
21- Change incontinence products regularly	37 (67.2)	18 (32.7)	51 (92.7)	4 (7.2)	47 (85.4)	8 (14.5)	0.002
22- Assess skin integrity regularly	38 (69)	17 (30.9)	47 (85.4)	8 (14.5)	48 (87.2)	7 (12.7)	0.029
23- Inspect high-risk patients' skin regularly for changes and erythema.	35 (63.6)	20 (36.3)	36 (65.4)	19 (34.5)	35	35 (63.6)	20 (36.3)
24- Use appropriate skin care products	38 (69)	17 (30.9)	31 (56.3)	24 (43.6)	41 (74.5)	14 (25.4)	0.11

Table 6 shows the nurses' performance of pressure ulcer evidence based guidelines before and after education about EBG. It was found that 41.8% of the ICU nurses did not apply prophylactic dressing or did not position the patient on the area of erythema, which increased at the post-test and follow-up with a statistical significance difference between nurses presented by P values of 0.000 and 0.001, respectively. On the other hand, 74.5% of the ICU nurses did position changes to patients every 2 hours at the pre-test and also increased to 90.9% and 87.2% at the post-test and follow-up with a statistical significance difference between nurses at a P value of 0.02.

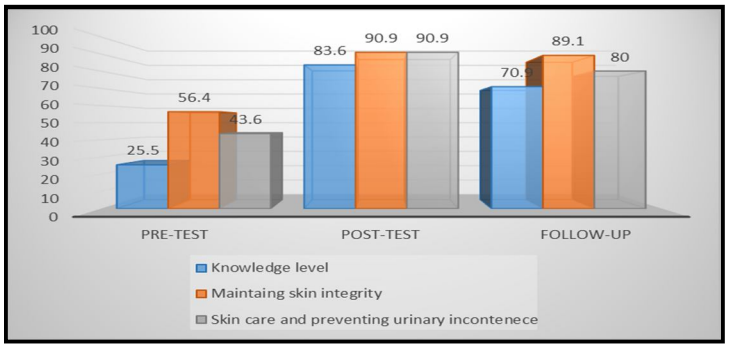

Figure 2: Compare the satisfactory level of nurses' performance before and after the Evidence Based educational Guidelines (EBG)

Figure 2: shows that the satisfactory level of nurses' knowledge and performance was lower before the education about the EBG and improved at the post-test and follow up

Table 7: Relation between socio-demographic characteristics of the studied sample and their total knowledge levels (n = 55)

Items	Total knowledge level Pre test				Total knowledge level Post test				Total knowledge level Follow UP			
	Unsatisfactory (n = 14)		Satisfactory (n = 41)		Unsatisfactory (n = 9)		Satisfactory (n = 46)		Unsatisfactory (n = 16)		Satisfactory (n = 39)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age												
Less than25	9	25.7	26	74.3	6	17.1	29	82.9	11	31.4	24	68.6
25- 30	5	26.3	14	73.7	3	15.8	16	84.2	5	26.3	14	73.7
31 – 35	0	0	1	100	0	0	1	100	0	0	1	100
Fisher test/ *P* – value	.492(1.00) NS				.603(1.00)NS				.616(.833)NS			
Gender												
Male	7	22.6	24	77.4	3	9.7	28	90.3	9	29	22	71
Female	7	29.2	17	70.8	6	25	18	75	7	29.2	17	70.8
Fisher test/ *P* – value	.308(.579) NS				2.31(.157)NS				.991(1.00)NS			
Marital status												
Single	11	29.7	26	70.3	3	8.1	34	91.9	13	35.1	24	64.9
Married	3	17.6	14	82.4	6	35.3	11	64.7	3	17.6	14	82.4
Other	0	0	1	100	0	0	1	100	0	0	1	100
Fisher test/ *P* – value	1.23(.633) NS				4.15(.032*)				2.10(.165)NS			
Unit												
Chest care unit	7	46.7	8	53.3	4	26.7	11	73.3	3	20	12	80
Neurosurgical unit	3	37.5	5	62.5	0	0	8	100	4	50	4	50
Urology care unit	1	12.5	7	87.5	1	12.5	7	87.55	2	25	6	75
ICU	3	12.5	21	87.5	4	16.7	20	83.3	7	29.2	17	70.8
Fisher test/ *P* – value	6.66(.064) NS				.237(.674)NS				2.32(.541)NS			
Years of experience												
1-5yrs	12	28.6	30	71.4	6	14.3	36	85.7	14	33.3	28	66.7
6-10yrs	2	16.7	10	83.3	3	25	9	75	2	16.7	10	83.3
11-15yrs	0	0	1	100	0	0	1	100	0	0	1	100
Fisher test/ *P* – value	1.01(.784) NS				1.50(.497)NS				1.55(.627)NS			
Qualification												
Diploma	1	33.3	2	66.7	0	0	3	100	0	0	3	100
Technical	13	27.7	34	72.3	8	17	39	83	15	31.9	32	68.1
Bachelor	0	0	5	100	1	20	4	80	1	20	4	80
Fisher test/ *P* – value	1.76(.418) NS				.545(.1.00)NS				.105(1.00)NS			
Residence												
City	4	23.5	13	76.5	4	23.5	13	76.5	6	35.3	11	64.7
Village	10	26.3	28	73.7	5	13.2	33	86.8	10	26.3	28	73.7
Fisher test/ *P* – value	.049(1.00) NS				.906(.435)NS				.451(.533)NS			

Percentage done by row ***NS= No Significant difference***

Table 7 presents the relationship between the socio-demographic characteristics of the studied sample and their total knowledge levels, performance score, and application of pressure ulcer prevention guidelines. There were negative relations and no statistically significant difference between nurses in all items except marital status

Discussion

A pressure ulcer (PU) is pressure or pressure in combination with shear and/or friction forces **(Akhkand, Seidi , Ebadi, 2020).** The burden of pressure ulcers is so high that some regulatory bodies have set goals to reduce the number of patients, and others have introduced financial penalties and/or incentive schemes to reduce the development of PUs **(Wu, & Wang, et al., 2022).** The prevalence of PU is mentioned as an indicator of the quality of hospital care, which is widely accepted as a nursing-sensitive measure. In addition to causing suffering and reducing the quality of life of patients, PUs are associated with high costs of health care and prolonged nursing care and can lead to life-threatening situations **(Grešš Halász & Bérešová, et al., 2021)**.

Critically ill patients are at high risk for PUs, the cost of its treatment is two and a half times the cost of preventing them. Nursing remains at the forefront of protecting and safeguarding the patient from PUs. Successful prevention of PUs requires that caregivers have adequate knowledge of this complication and preventive practice measures **(Hu, Sae-Sia, & Kitrungrote, 2021)**. **So the present study was held to achieve** the following aim: Evaluate the effect of nurses' compliance with evidence-based guidelines on pressure ulcer prevention for critical patients.

The first part: covers the socio-demographic information of the critical care unit nurses as age, gender, level of education, years of experience..etc. The present study showed that more than half of the ICU nurses' age were less than 25 years old. The head nurses and the university hospitals' responsible authority personnel often choose newly graduated nurses in order to provide a high level of care for critical patients at the ICU and to be easily trained and have the physical power to handle the increased number of duties at the ICU. The results of the current study agreed with **Awoke, (2020)** who stated that the majority of the studied group nurses age ranged from 20 to 30 years. Also, a further validation by **Mengist & Geletie, (2022**) stated that the majority of the studied sample age ranged from 21-30 years.

The findings of the present study showed that more than half of the nurses who participated were males. These results may be explained by the fact that nursing is not only a universal feminine profession. The result of the current study agreed with **Berihu, Wubayehu, & Teklu, et al., (2020)** who reported that male nurses' had a higher incidence of working in the ICU than female nurses. Also, this result contradicted **Parvizi**, **Haddadi, & Mollaei, et al., (2023) who** stated that female nurses' had the majority of work in the ICU than male nurses. Also, this result contradicts **Malinga & Dlungwane,**

(2020) who found that more than two-thirds was females work in the ICU.

Concerning years of experience; the present study discovered that the majority of the nurses in the study had experienced only between 1-5 years because they were newly graduated. Study results were reinforced by **Malinga & Dlungwane, (2020)** found that more than half of nurses had 5 to 10 years working at the ICUs. Also, these findings were in accordance with a study done by **Azhar, Sharoni & Fauzi, et al., (2022)** which stated that about one-quarter of the studied group had experience of five years and below. Concerning educational level; the present study findings demonstrated that, more than two-thirds of the participants graduated from a technical institute. This result contradicted **Sabaq & Amer, (2018)** who found that two-thirds of participants held a diploma degree in nursing. This result contradicted **Karacabay, Savci, & Dalkılıç, et al., (2023)** who found that the majority of the paricipant's sample had a bachelor of nursing degree.

The second part: Evaluation of critical care nurse staff's knowledge about the occurrence, manifestation, and management of pressure ulcers. The present study results found that less than half of the ICU nurses had an incorrect answer about the classification of pressure ulcers at the pre-test but, after the education intervention at the post-test and follow-up found that, the majority of the nurses answered correctly to the same question. This means that the nurses at the ICUs needed further education development about pressure ulcers and their classification to improve their compliance with the care. The current study results were approved by **Dalvand, Ebadi, & Gheshlagh, (2018) who** stated that the global knowledge of nurses on pressure ulcers and their prevention was lower than the acclaimed level.

The findings of the present study showed more than half of the ICU nurses answered incorrectly the causes of pressure ulcers which were correctly answered in higher levels of the nurses' sample at the post-test and follow-up. Also, one-third did not answer correctly regarding the sites of pressure ulcers but the majority answered the same question correctly after the educational interventions which prove that in order to increase the ICU nurses compliance their knowledge should improve first. These results in this current study in line with **Muhammed, Bifftu, & Temachu, et al., (2020)** who illustrated that, generally a nurse's knowledge of pressure ulcer causes and sites was poor.

The present study results found that more than half of the studied sample had incorrect answers about stages, manifestations, diagnosis, and management measures of pressure ulcers. This explains the importance of providing continuous education for ICU nursing staff about pressure ulcers to reach a high level of compliance in practice for critically ill patients. The data analysis of the present study was in the same line with **Hamdy, Shafik & Mohamed, (2023)** who described that the majority of nurses had a low level of knowledge concerning pressure ulcer clinical picture, causes manifestation, and nursing role. Also, **Grešš Halász & Bérešová, et al., (2021)** displayed nurse's knowledge and attitudes toward pressure ulcer was insufficient. Therefore, it is essential to enhance the continuing general education and practice of nurses.

The third part: is concerned with the ICU nurses' performance in upholding skin integrity and adhering to pressure ulcer standards. The study showed that less than half of the nurses did not use non-alcohol-based moisturizing agents after cleansing the skin at the pre-test before the education but after the education high percentage of them did it at the post-test and at the follow-up in order to prevent pressure ulcers for critically ill patients. The study results demonstrated that one-third of the ICU nurses did not apply pectin-based or hydrocolloid skin barriers directly over excoriated skin and did not massage the reddened bony prominences area. But after the educational intervention, they did it with statistical significance. This result proves the importance of continuously assessing and evaluating nurses' performance to identify the area of weakness that needs further support in education and training in the ICU.

The present results were in agreement with **Lotfi, Aghazadeh, & Asgarpour, et al., (2019)** who observed that the mean score and standard deviation of nurses' performance in pressure ulcer prevention was lower than the accepted level of nursing care. However, the data of the current study disagreed with **Sham, Sharif, & binti Moksin, et al., (2020)** who reported a high percentage of the studied nurses had good practice towards pressure ulcer prevention by paying more attention to pressure points prone to the ulcer, as well as, by turning a patient two hourly, while only minority percent of the nurses reported to had poor practice on pressure ulcer prevention.

In relation to the ICU nurses' performance of pressure ulcer prevention guidelines it was observed that less than half of them did not use prophylactic dressing and most of them did not do position changes every two hours also they did not apply skin barrier cream. This result indicated that there was a professional gap between nurses' compliance to the PUs performance at the ICU and the published guidelines. **Hamdy, Shafik & Mohamed, (2023)** were in the same line of the current study and reported that the nurses' practice for pressure ulcer prevention and management was incompetent. **Gaspar, Peralta, & Marques, et al., (2019)** reported that multiple intervention programs about prophylactic dressings, support surfaces, repositioning, preventive skin care, system reminders, and education for health care professionals were more effective in decreasing PUs, which always in compliance with other preventive measures

The present study reported that most nurses had inadequate performance regarding pressure ulcer guidelines before the educational intervention with positive statistical significance. The current findings are in line with **Khojastehfar, Ghezeljeh, & Haghani, (2020)** showed that based on the mean score of knowledge, attitude, and practice of the nurses about the pressure ulcer prevention guidelines was lower with a positive statistically significant., this result was supported by **Vajargah, Mollaei & Falakdami, et al., (2022)** suggested that, nurses' practice toward PUs prevention had a significant negative relationship with lack of job policies and guidelines about PUs prevention.

The present study shows that the satisfactory level of nurses' knowledge and performance was lower before the education about the EBG and improved at the post-test and follow up. This finding was in the same line with **Sardari, Esmaeili, & Ravesh et al., (2019)** who stated that nurses' performance in pressure ulcer prevention is not desirable, and the training program of pressure ulcer care can improve their performance in this regard. While this result was agreed with **Hashad & Hassan (2018)** who reported that the majority of nurses had a satisfactory practice score after the training compared to more than one-third of them had unsatisfactory practice scores before the training program. These findings are

in harmony with a study carried out by **Ramadan,& Mohamed (2020)** revealed that less than a quarter of the nurses included in the study carried out the pressure ulcer preventive bundle but after the education, the majority of them applied the pressure ulcer bundle with significant differences among study groups regarding the total competent scores of practice

The fourth part: Regarding the relationship between the personal data of the study group and total knowledge scores in pre-education and post-education programs, results revealed that there was no statistically significant relation between all personal characteristics and total knowledge scores at pre-test and post-test, current study agreed with **Hefnawy & Abd El-Monem (2017)** and **Ebi, Hirko & Mijena (2019**) The study identified that there had no significant difference in knowledge score Regarding relations between personal characteristics of the studied group and total practice score pre-education and post-education**,** results revealed that there was no statistically significant relation between all personal characteristics for studied group and their total practice score pre and post-educational program.

These results similar to **Saad Soliman, Mostafa Ragheb, & Sheta, et al., (2022)** reflected that there was no significant relation between the studied nurses' demographic characteristics in relation to total practice score. Regarding relations between the personal characteristics of the studied group and their performance application of pressure ulcer guidelines, results revealed that there was no statistically significant relation between all personal characteristics of the study group and their performance **Grešš Halász & Bérešová, et al., (2020)** it is important to focus on the education and practice of nurses concerning pressure ulcer preventive measures. Further advances in instructive programs and frequent measurement of these two parameters can lead to a significant reduction in the occurrence of pressure ulcers among critical patients.

Conclusion

Based on the results of the present study it can be concluded that: After providing the education for the studied nurses had a good compliance to pressure ulcers prevention evidence based guidelines for critical patients due to improvement in their knowledge and practice.

Recommendations

- In the light of the findings of the current study,

Nurses

- Educational needs should be assessed for staff and newly employed nurses working in critical care units and update the knowledge of staff nurses.

Hospital

- Provide continuous education and training sessions for all nurses working at different intensive care units about pressure ulcer EBG to improve their knowledge and compliance.

Patients

- Emphasize multidisciplinary collaboration to reliably implement EBGs in an effort to reduce pressure ulcer incidence among critical patients.
- Strategies for preventing hospital-acquired pressure ulcers should be based on the analysis of risk factors.

Researches

- Replication of the study on a larger probability sample from different geographical areas in Egypt to obtain more generalizable data.

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