Effect of Evidence Based Practices Guidelines on Immobilized Orthopedic Patients' Outcome regarding Pressure Ulcers

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Abstract

Background: Pressure ulcers are a prevalent health condition that presents a nursing and social strain. The risk of death is two to six times higher in a patient with a pressure ulcer than in those with intact skin. **Aim:** assessing the influence of applying evidence-based practices guidelines on immobilized orthopedic Patients' Outcome regarding Pressure Ulcers. **Method**: This study was done at Benha University Hospital's orthopaedic unit utilizing a quasi-experimental research approach. This research enrolled a purposive sample of sixty adult patients. , divided equally into study and control groups. Two tools were employed for collecting data. Tool I; Comprehensive skin assessment sheet and tool II; Braden Risk Assessment Scale. **Results:** There was a statistically significant variation in patients' Outcomes regarding pressure ulcers following application of evidence-based practises guidelines between the study and control groups. Otherwise, orthopedic immobilized patients receiving standard nursing care developed multiple and advanced stages of pressure ulcers. **Conclusion:** Implementation of evidence-based practice guidelines significantly improved orthopedic immobilized patients' outcome regarding pressure ulcers as compared to orthopedic immobilized patients receiving normal nursing care. **Recommendations**: Pressure ulcer prevention in accordance with evidence-based practises guidelines should be successfully applied for orthopedic immobilized patients who are at risk of having pressure ulcers.

Keywords: Evidence Based Practices Guidelines, Patients' Outcome, Pressure Ulcers, Immobilized patients.

Introduction

Pressure ulcers (PUs) are a significant health problem, PUs are thought to be a result of poor quality nursing care. Pressure ulcers are identified as localised damage to the skin and/or subcutaneous tissue, most frequently over a bony prominence, caused by pressure alone or in conjunction with shear. **(Sayılan, 2019).** Pressure ulcers are sores developed by persistent pressure resulting in underlying tissue damage. **(Barakat, et al., 2018).**

Pressure-induced skin damage consequences range from non-bleachable erythema to severe ulcers that extend to the bone. Not only does the ulcer exert a tremendous strain on the sufferer, but additionally on whole health care system. Eliminating pressure ulcer incidence is a critical component of contemporary objectives for patient safety. **(Tirgari, et al., 2018; Charalambous, et al., 2019).**

Pressure ulcer warning signs encompass uncommon changes in the colour or texture of the skin, swelling, pus-like drainage, and tender areas. They are more prevalent in people with limited mobility, like hospitalized or long-term care settings. The most often reported risk factors included old age, history of cardiovascular and diabetes, longer ICU stay, and infrequent repositioning**. (De Oliveira, et al., 2017; Wurzer, et al., 2018)**.

Pressure ulcer prevention strategies commence with the determination of high-risk individuals. Numerous interventions aimed at preventing pressure ulcers and eliminating friction and shear comprise a variety of support surfaces (such as integrated bed systems, cushions overlays and mattresses), nutritional supplementation, repositioning, skin care (for example, dressing and incontinence management), and topical creams (**Porter, et al., 2018; Saghaleini, et al., 2018).**

Currently, knowledge management, changing societal health care preferences, and cost-effective care policies have made

evidence-based practices mandatory. Evidence-based practice (EBP) application has become the standard of health care practice. Nurses are anticipated to apply the best evidence on a broad variety of topics, however, the majority of nurses lack the time, resources, and/or skills necessary to access and assess the quality research and evidence required for evidence-based nursing practise. (**Orhan, 2017; Serraes, et al., 2018 & Sardaril, et al.,2019).**

The necessity of evidence-based initiatives in pressure ulcer prevention cannot be underestimated. Skin care, nutrition, position changes, risk assessment, and education are all included in the scope of essential practises; these applications encompass the basis of nursing care. **(Tsaras, et al., 2016; Demarré, et al., 2016; Gunes, 2017; Van, et al., 2018).** The advantages of evidence-based practise interventions cannot be maximised unless compliance with intervention guidelines is taken into account. **(Lavallee, et al., 2017).**

Significance of the study:

Pressure ulcers are the fifth prevalent cause of potentially preventable admissions. Additionally, between 57% and 60% of all pressure ulcers develop in hospitals. Pressure ulcers are responsible for 2% of preventable mortality. **(Kwong, et al., 2016)**.

Mobility and exercise are two of the most significant predictors for developing a pressure ulcer. because of the fact that these two parameters are significantly impaired in orthopedic patients, so orthopedic patients are at an increased risk of developing pressure ulcers as a result of the complications associated with bed rest and other posture restrictions. **(Al-Shadedi, 2012; Sayılan, 2019).** It was shown by earlier investigations that PUs prevalence rates ranged from 13.9 % to 29 % across patients in orthopaedic settings, indicating that PUs are a significant issue in orthopaedic departments. **(Moore & Dealey, 2014).**

In Egypt, there are no statistics on the prevalence or incidence of pressure ulcers across immobilised patients due to a fear of legal accountability. **(El Enein & Zaghloul, 2011).** Despite the rising number of beds inhabited by orthopaedic patients who suffer from pressure ulcers, investigations on preventing pressure ulcer guidelines are seldom done at Benha University Hospital. As a result, the present study intended to determine the influence of evidence-based practise guidelines on immobilized orthopedic Patients' Outcome regarding Pressure Ulcers in orthopedic unit at benha university hospital, Qalubyia Governorate, Egypt.

Operational Definitions:

Evidence Based Practices Guidelines, also known as clinical practice guidelines, "are statements that have been established in a systematic manner to aid nurses and patients decisions about appropriate health care appropriate in certain clinical situations. In compliance with Agency on Healthcare Research and Quality (AHRQ), such "Guidelines are not mandatory protocols, but rather are intended to illustrate generally suggested interventions to be considered by a knowledgeable healthcare provider **(Gunes, 2017).**

The Immobilized Patient: The immobilised patient is someone who is restricted to bed and incapable of moving or changing positions in bed alone, so he/she is at a high risk of developing a pressure ulcer. **(Mohamed & Weheida, 2015**).

Patients' Outcome:

The patients' outcome in this study means a pressure ulcer risk level reduction as a result of intervention by evidence-based practices guidelines.

The Study's Aim

Evaluating the Evidence Based Practices Guidelines effect on Immobilized orthopedic Patients' Outcome regarding Pressure Ulcers.

Research Hypothesis

To accomplish this study's objective, one hypothesis was evaluated:

Hypothesis I: The patients' outcome will be significantly better among immobilized patients receiving the evidence-based practices

guidelines compared to immobilized patients receiving routine nursing care.

Subject and Methods

Research Design

This study applied a quasi-experimental research design (pre-and post-test).

Research Setting

This study was performed at Benha University Hospital's orthopedic department. The orthopedic department has 17 rooms, with a total number of 68 beds.

Sampling

Based on the inclusion criteria, a purposive sample of adult patients admitted to the orthopedic department at Benha University Hospital. The inclusion criteria were as follows: immobilized patients; both genders, ages ranging from 20-60 years old, stayed more than one week at the hospital and accepting to participate in the study. The exclusion criteria comprised patients who actually suffered from pressure ulcers.

The sample size was determined utilizing the Epi info (7) statistical programme according to the preceding year's statistical report on orthopedic department admissions at Benha University Hospital from the statistics department in 2020 at a confidence level of 90% and an acceptable margin of error 5%. The sample size was 103 in total. Sixty patients consented to participate in the study. Forty participants were precluded from the research due to non-compliance with the inclusion criteria, and three participants refused to participate. Sixty patients who met the inclusion criteria and admitted to participate were comprised in the final sample size. They were randomly categorized into two equal groups (study and control), and every group consisted of 30 patients.

The participants assigned to the study and the control group by using simple randomization as follows: Each participant assigned a number; the numbers were written on small pieces of paper, placed in a container, well mixed, and then taken out one by one till the required sample was assigned. The investigator collected the container's contents and pulled the number from it. The study group got evidence-based guidelines for pressure ulcer prevention, whereas the control group received regular hospital care.

Tools for Data Collection

To accomplish this study's objective, two tools were utilized for data collection.

Tool (I): Comprehensive Skin Assessment Sheet. This tool composed of two major parts: **Part I: Personal data and Medical history of patients:** It included data related to age, gender, diagnosis, present medical treatment and activities of daily living.

Part II: Comprehensive Skin Assessment pre and post-intervention: It was established by the investigators depending on the review of relevant literature**s; (Tirgari, et al., 2018; Moore & Cowman, 2014; Atyea, et al., 2013; Western Australia Pressure Injury Forum, 2013)**. It included two sections; section one included six subscales for evaluating patients' skin characteristics, including; skin integrity, color, turgor, tissue perfusion moisture and temperature; section two included five subscales for evaluating pressure ulcer related data, including; location, stage, exposed tissue, exudate and odor.

Tool II: Braden Risk Assessment Scale: It was adopted from (**Mohamed& Ibraheem, 2019**; **Mohammed, et al., 2018**; **Mohamed & Weheida, 2015; Bergstrom, et al., 1987)** to determine the patient's risk for pressure ulcers. Six subscales comprise this scale: sensory perception, skin moisture, activity, mobility, nutrition, and friction/shear.

Scoring: Except for friction and shear, which were scored 1–3, the six subscales were rated from 1(least impaired) to 4(most impaired). The overall score should be between six and twenty-three points. The lower the score, the more susceptible the skin is to breakdown.

- A score ranging from 19 to 23 at no risk.

- A score of 15-18 at mild risk.

- A score of 13-14 at moderate risk.

- A score of 10-12 at high risk.

- ≤ 9 at severe risk development.

Validity and Reliability of the Study Tools:

Validity: The tools' validity was assessed by a jury of five specialists from Benha University's medical-surgical nursing department and faculty of nursing. Modifications were made in accordance with the panel's judgments regarding sentence clarity, appropriateness, and completeness of the content in order to obtain at the final valid version of the tools. This phase lasted one month, from the commencing to the end of January 2021.

Reliability: The proposed tools' reliability was tested by assessing their internal consistency by utilizing the Cronbach's alpha test. Tool reliability was r = 0.867 for Comprehensive skin assessment, and r = 0.98 for Braden Risk Assessment Scale. Hence, the study tools demonstrate a high degree of reliability.

Pilot Study: A pilot study was undertaken following the tools development and prior to initiating the actual data collection in order to examine the clarity, applicability, and time required to fill the tools. The pilot study enrolled 10% of the sample (n=6) that were precluded in the major study sample. Certain modifications were performed in compliance with the pilot study's findings. This phase lasted one month, from the commencing to the end of February 2021

Fieldwork:

Data collection procedure was done in orthopedic department at Benha University Hospital. throughout two-phase of assessments by utilizing tool I and II. Prior to executing the evidence-based practises guidelines for evaluating patients at risk for pressure ulcers, the first phase of assessment was collected. Then, after executing the evidence-based practises guidelines for evaluating improvement for patients at risk, the second phase of assessment was collected.

The researcher visited the previously mentioned setting three days weekly (morning and afternoon). Data collection procedure was done through four phases; preparatory, assessment, implementation and evaluation phase.

Preparatory phase:

The investigator prepared the environment and supplies necessary for performing the investigation, reviewing current and related literatures, and theoretical knowledge about various aspects of the study, utilizing textbooks, evidence-based articles, internet periodicals, and journals.

Designing Evidence-based practise guidelines regarding prevention of pressure ulcers utilizing a multi-staged and theoretically driven approach. The following articles provide useful insights on how to do this **(National Pressure Ulcer Advisory Panel, 2014; Qaseem, et al., 2015 & Patricia, et al., 2017)**. The guidelines development spent a period from the commencing of March 2021 to the end of April 2021. The investigators designed an Arabic booklet concerning pressure-ulcer preventive practices containing theoretical and practical parts. The theoretical part contained general objectives, specific objectives, the definition of PU, causes of PU, risks of PU, pressure points in the body, signs and symptoms of PU, and the degrees of PU. The practical part contains; skin assessment, and head of bed ≤ 30º, skin care, turning and positioning, head elevation, nutritional assessment, and pressure relief.

Assessment phase: The researcher interviewed the patients in orthopedic department at Benha University Hospital for collecting baseline data, at the start of the interview, greeted them, indicated the study's purpose, and gave oral consent for participating in the study and indicating the benefits from the study. Data on patients' profiles were obtained from both groups utilizing tool I (comprehensive skin assessment sheet) to evaluate personal information, medical history,

and skin features. The investigator precluded individuals who already had pressure ulcers during the first skin assessment and utilizing tool II (Braden Risk Assessment Scale) through evaluating each of the six categories and chose the description for each category that most accurately described the client's present status. This phase lasts around 20-25 minutes.

Implementation phase:

The investigator prepared the teaching aids and media (pictures, handouts) to facilitate the implementation of evidence-based practices guidelines. Following that, they organized training sessions depending on the contents of the booklet, taking into account the appropriate usage of the Arabic language that suits patients' level. In this study, motivation and reinforcement throughout training sessions were utilized to increase motivation for sharing. The session lasted between 30 to 45 minutes, with ten minutes for discussion and feedback.

During this phase, the researcher implemented evidence-based practise guidelines for the study group only regarding pressure ulcer prevention. It comprised instructional points (were taught in a single session) and practical points (performed for about 3-5 individuals separately and repeated every day for one week). At the end of the session, supportive materials (Arabic Booklets) were distributed to each patient in the study group only.

Teaching methods for the practical part were demonstration and re-demonstration, whereas for the theoretical part were lecture and group discussion. Handouts, posters, and videos were all used as media.

The researcher also monitored the usual care provided to the control group during this phase regarding prevention of pressure ulcers and noticed that all nurses in the orthopedic department comply only with a skin assessment and pressure relief in their routine hospital care for orthopedic patients, but do not comply with risk assessment, nutritional assessment, skin care, elevation head of bed ≤ 30, and for heel elevation, This might be because of the absence of opportunity for nurses to receive training about pressure ulcer prevention programs, absences of hospital policies regarding the use of risk assessment tools and lack of equipment all of which are contributing factors that affect nurses' ability to provide quality care to patients, which in turn has an impact on patients' outcomes.

Evaluation phase: Through the Braden scale utilization, throughout this phase, the investigator reviewed every individual in the study and control groups utilizing part II of tool I (comprehensive skin assessment) and analyzed the impact of applying evidence-based practices guidelines for study group and impact of usual nursing care for control group. It was utilized daily for one week

Administrative and Ethical Considerations

Permission granted by hospital administrators and the head of the orthopedic unit at Benha University Hospital. The aims and nature of the investigation were revealed, making it possible to conduct the study with minimal resistance.

The study was done with due regard for ethical research standards and the participants' rights to participate or not in the study, as well as the fact that their information will be treated confidentially and only for the purpose of research. Because respondents were not forced to provide their identities, their anonymity was maintained.

Statistical Analysis:

Data analysis was conducted utilizing the SPSS software (version 25). The Kolmogorov-Smirnov test was utilized for evaluating the normal distribution of quantitative variables, and the Chi-square test was utilized for comparing nominal variables within and across groups. Fisher's exact test was applied on smaller sample sizes, alternative to the chi-square test, when the frequency count is < 5 for more than 20% of cells. The independent t-tests were for comparing the mean scores in two groups, Mann Whitney test was used for non-parametric quantitative data. Friedman test was used to compare more than two periods or stages. For multivariate analyses, comprising pressure ulcer risk of occurrence as

a dependent factor, linear regression was utilized. Significant was considered as a p-value < 0.05, and highly significant as a p-value < 0.001.

Results

Table 1 Demonstrates comparison between both studied groups on the basis of their personal data and medical history. It shows that 36.7% of study group and 46.7% of control group were aged between 30- < 40 years, with the mean score 39.23 ± 1.10 and 39.26 ± 0.82, respectively. Regarding gender, 66.7% and 53.3% of both study and control groups, respectively, were males. Regarding diagnosis, 43.3% of study and 46.7% of control group had a pelvic fracture and 60.0% & 53.3%, respectively, had internal fixation. 90% of both study and control groups were dependent.

Table 2 Demonstrate comparison between both studied groups regarding comprehensive skin characteristics throughout different study periods pre and post-guidelines implementation (7 th day). It shows that there were no statistically significant (P>0.05) differences in skin characteristics between the two groups before the guidelines were implemented, but there were highly statistically significant (P ≤ 0.001) differences in skin temperature, color, and moisture between the two groups after the guidelines were implemented (7 th day).

Table 3 Indicates a comparison of risk assessment for pressure ulcers between the two examined groups during several study periods of guidelines implementation. It illustrates that there were highly statistically significant between both studied groups regarding all subscales of Braden risk assessment for pressure ulcers at P ≤0.001

Table 4 demonstrates comparison of patients' level of risk for pressure ulcers between both investigated groups during various study periods. It denotes that there were highly statistically significant at P ≤0.001 regarding the difference in pressure ulcer risk between control and intervention groups during the 2nd, 6th and 7th days. There were statistically significant at P ≤ 0.05, regarding the difference in pressure ulcer risk between control and intervention groups during the 3rd, 4th and 5th days. There were no statistical significant at P>0.05 regarding the difference in pressure ulcer risk between control and intervention groups during 1st day.

Figure 1 Depicts distribution of both investigated groups in compliance with pressure ulcer risk of incidence during the 7th day after guidelines implementation.it indicates that all study group patients had a mild risk of pressure ulcer incidence during the 7th day after guidelines implementation. 43.3% of control group had high risk, and 46.7% had a very high risk of incidence of pressure ulcer.

Table 5 Demonstrate comparison of pressure ulcer data between both investigated groups during various study periods pre and post-guidelines implementation. It indicates that the pressure ulcer stage and exposed tissue were highly statistically significant at P≤0.001. There were statistically significant in pressure ulcer exudate at P 0.05. There were no statistical significant in the location and odor of pressure ulcers at P>0.05.

Table 6 Depicts Multiple Linear Regression Analyses for Predictor Variables of pressure ulcer risk of incidence in both intervention and control groups at the 7th day post guidelines implementation. Multivariate linear regression model in this table presents that pressure ulcer risk of incidence was best predicted by gender (p= 0.052*) among intervention group accounting for 72.6 % of the variance in risk of incidence and both age and gender among control group (p= 0.008*& 0.027*, respectively), accounting for 68.9 % of the variance in risk of incidence.

Table (1). Distribution of both studied groups in compliance with their Personal data and medical history.

Demographic characteristics\ medical history	Intervention group No=30		Control group No=30		X^2	p-value
	(No.)	%	(No.)	%		
Age						
- 20-<30	9	30.0	5	16.7	5.426	0.143 n.s
- 30- < 40	11	36.7	14	46.7		
- 40-<50	4	13.3	9	30.0		
- 50-60	6	20.0	2	6.7		
Mean ± SD	39.23 ± 1.10		39.26 ± 0.82		t-test= (- 0.132) p value = (0.985 n.s)	
Gender						FEp
-Male	20	66.7	16	53.3	1.111	0.430 n.s
-Female	10	33.3	14	46.7		
Diagnosis						
-Pelvic fracture	13	43.3	14	46.7	0.148	0.985 n.s
-Knee fracture	9	30.0	9	30.0		
-Spine fracture	5	16.7	4	13.3		
-Several fractures	3	10.0	3	10.0		
Present medical treatment						
-Internal fixation	18	60.0	16	53.3	1.714	
-External fixation	4	13.3	7	23.3		0.788 n.s
-Traction	2	6.7	1	3.3		
- Cast	1	3.3	2	6.7		
-Spinal brace	5	16.7	4	13.3		
Activities of daily living						
- Dependent	27	90.0	27	90.0	0.000	1.000 n.s
-Needs assistance	3	10.0	3	10.0		

(n.s) Not Significant (P>0.05) FEp: p-value for Fisher exact for chi-square

Table 2: Comparing comprehensive skin characteristics between both studied groups during various study periods Pre and post-guidelines implementation (7 th day).

Study periods / Skin characteristics	Pre guidelines			Post guidelines (7th day)		
	Intervention group No=30 No (%)	Control group No=30 No (%)	X^2 test P-value	Intervention group No=30 No (%)	Control group No=30 No (%)	X^2 test P-value
Temperature			1.111			17.067
1. Normal	10 (33.3)	14 (46.7)	FEp	23 (76.7)	7 (23.3)	FEP
2. Localized heat	20 (66.7)	16 (53.3)	0.430 n.s	7 (23.3)	23 (76.7)	<0.001**
3. cool	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
Color			0.000			20.166
1. Pink	7 (23.3)	7 (23.3)	1.000 n.s	26 (86.7)	9 (30.0)	<0.001**
2. Pallor	18 (60.0)	18 (60.0)		4 (13.3)	18 (60.0)	
3. Erythema	5 (16.7)	5 (16.7)		0 (0.0)	3 (10.0)	
Moisture			3.529			24.782
1. Moist	20 (66.7)	20 (66.7)	0.171 n.s	24 (80.0)	5 (16.7)	<0.001**
2. Excessive moist	10 (33.3)	7 (23.3)		6 (20.0)	21 (70.0)	
3. Dry	3 (10.0)	3 (10.0)		0 (0.0)	4 (13.3)	
Turgor			0.417			3.750
1. Normal (< 3 sec.)	23 (76.7)	25 (83.3)	0.519 n.s	27 (90.0)	23 (76.7)	0.050 *
2. Impaired (>3 sec.)	7 (23.3)	5 (16.7)		3 (10.0)	7 (23.3)	
Tissue perfusion			0.417			
1. Normal (capillary refill time less than 3 sec.).	23 (76.7)	25 (83.3)	0.519 n.s	27 (90.0)	23 (76.7)	3.750 0.050 *
2. Decreased (capillary refill time more than 3 sec.).	7 (23.3)	5 (16.7		3 (10.0)	7 (23.3)	
Integrity						
1. Intact	30 (100.0)	30 (100.0)	NA	27(90.0)	16 (53.3)	9.932
2.Pressure ulcer	0 (0.0)	0 (0.0)		3 (10.0)	14 (46.7)	0.002*

* Significant at <0.05, ** highly statistically significant at ≤0.001 NA not applicable
FEp: p value for Fisher exact for chi square (n.s) Not Significant (P>0.05)

Table 3: Comparing risk assessment for pressure ulcers between both studied groups during various study periods of guidelines implementation, control group (n=30) and intervention group (n=30).

Study phases / Subscales	Braden risk assessment for pressure ulcer: Intervention group 1st day X± SD	2nd day X± SD	3rd day X± SD	4th day X± SD	5th day X± SD	6th day X± SD	7th day X± SD	Fr test P value	Control group 1st day X± SD	2nd day X± SD	3rd day X± SD	4th day X± SD	5th day X± SD	6th day X± SD	7th day X± SD	Fr test P value	U test P value
Sensory perception	1.43 ±0.50	1.23 ±0.43	2.46 ±0.50	2.46 ±0.50	2.46 ±0.50	3.66 ±0.47	3.83 ±0.38	156.324 <0.001**	1.57 ±0.50	1.73 ±0.45	2.57 ±0.50	2.57 ±0.50	2.57 ±0.50	2.33 ±0.48	1.63 ±0.66	112.657 <0.001**	390.000 P1 =0.306ns
Moisture	1.43 ±0.50	1.23 ±0.43	2.46 ±0.50	2.46 ±0.50	2.46 ±0.50	3.66 ±0.47	3.83 ±0.38	156.324 <0.001**	1.57 ±0.50	1.73 ±0.45	2.57 ±0.50	2.57 ±0.50	2.57 ±0.50	2.33 ±0.48	1.63 ±0.66	112.657 <0.001**	225.000 P2= <0.001**
Activity	1.43 ±0.50	1.23 ±0.43	2.46 ±0.50	2.46 ±0.50	2.46 ±0.50	3.66 ±0.47	3.83 ±0.38	156.324 <0.001**	1.57 ±0.50	1.73 ±0.45	2.57 ±0.50	2.57 ±0.50	2.57 ±0.50	2.33 ±0.48	1.63 ±0.66	112.657 <0.001**	312.000 P3= 0.029*
Mobility	1.43 ±0.50	1.23 ±0.43	2.46 ±0.50	2.46 ±0.50	2.46 ±0.50	3.66 ±0.47	3.83 ±0.38	156.324 <0.001**	1.57 ±0.50	1.73 ±0.45	2.57 ±0.50	2.57 ±0.50	2.57 ±0.50	1.63 ±0.66	1.63 ±0.66	112.657 <0.001**	307.500 P4= 0.025*
Nutrition	1.43 ±0.50	1.23 ±0.43	2.46 ±0.50	2.46 ±0.50	2.46 ±0.50	3.66 ±0.47	3.83 ±0.38	156.324 <0.001**	1.57 ±0.50	1.73 ±0.45	2.57 ±0.50	2.57 ±0.50	2.57 ±0.50	2.33 ±0.48	1.63 ±0.66	112.657 <0.001**	320.000 P5= 0.041*
Friction and shear	1.43 ±0.50	1.23 ±0.43	2.46 ±0.50	2.46 ±0.50	2.46 ±0.50	3.66 ±0.47	3.83 ±0.38	156.324 <0.001**	1.57 ±0.50	1.73 ±0.45	2.33 ±0.48	2.33 ±0.48	2.33 ±0.48	2.33 ±0.48	1.63 ±0.66	87.677 <0.001**	50.000 P6= <0.001**
Total	8.60 ±3.02	7.40 ±2.58	16.63+2.15	16.63+2.15	16.63+2.15	22.00+2.87	23.00+2.27	157.410 <0.001**	9.40 ±3.02	10.40 0+2.69	15.16+2.84	15.16+2.84	15.16+2.84	14.00+2.87	9.80 ±4.01	112.657 <0.001**	7.500 P7= <0.001**

(Fr) Freidman test p for overall difference throughout study phases within each group (U) Mann Whitney * Significant at ≤ 0.05, ** highly statistically significant at ≤0.001

(1) The difference in overall pressure ulcer risk between the intervention and control groups on 1 st day.

(2) The difference in overall pressure ulcer risk between the intervention and control groups on 2nd day.

(3) The difference in overall pressure ulcer risk between the intervention and control groups on 3rd day.

(4) The difference in overall pressure ulcer risk between the intervention and control groups on 4th day.

(5) The difference in overall pressure ulcer risk between the intervention and control groups on 5th day.

(6) The difference in overall pressure ulcer risk between the intervention and control groups on 6th day.

(7) The difference in overall pressure ulcer risk between the intervention and control groups on 7th day.

Table 4: Comparing patients' level of risk for pressure ulcers between both studied groups during various study periods

Study phases / Patients' ulcer risk levels	Intervention group (n=30)							Control group (n=30)						
	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. .(%)
Mild risk (15-18)	0 (0.0)	0 (0.0)	25 (83.3)	25 (83.3)	25 (83.3)	30 (100.0)	30 (100.0)	0 (0.0)	0 (0.0)	17 (56.7)	17 (56.7)	17 (56.7)	10 (33.3)	3 (10.0)
Moderate risk (13-14)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
High risk (10-12)	13 (43.3)	7 (23.3)	5 (16.7)	5 (16.7)	5 (16.7)	0 (0.0)	0 (0.0)	17 (56.7)	22 (73.3)	13 (43.3)	13 (43.3)	13 (43.3)	20 (66.7)	13 (43.3)
Very high risk (≤9)	17 (56.7)	23 (76.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	13 (43.3)	8 (26.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	14 46.7
X^2 p-value	(1) 1.067 (0.302 n.s)		(2) 15.017 (<0.001**)		(3) 5.079 (0.024*)		(4) 5.079 (0.024*)	(5) 5.079 (0.024*)		(6) 30.000 (<0.001**)			(7) 49.091 (<0.001**)	

* Significant at ≤ 0.05, ** highly statistically significant at ≤0.001 (n.s) Not Significant (P>0.05)

(1) The difference in overall pressure ulcer risk between the intervention and control groups on 1 st day.
(2) The difference in overall pressure ulcer risk between the intervention and control groups on 2nd day.
(3) The difference in overall pressure ulcer risk between the intervention and control groups on 3rd day.
(4) The difference in overall pressure ulcer risk between the intervention and control groups on 4th day.
(5) The difference in overall pressure ulcer risk between the intervention and control groups on 5th day.
(6) The difference in overall pressure ulcer risk between the intervention and control groups on 6th day.
(7) The difference in overall pressure ulcer risk between the intervention and control groups on 7th day.

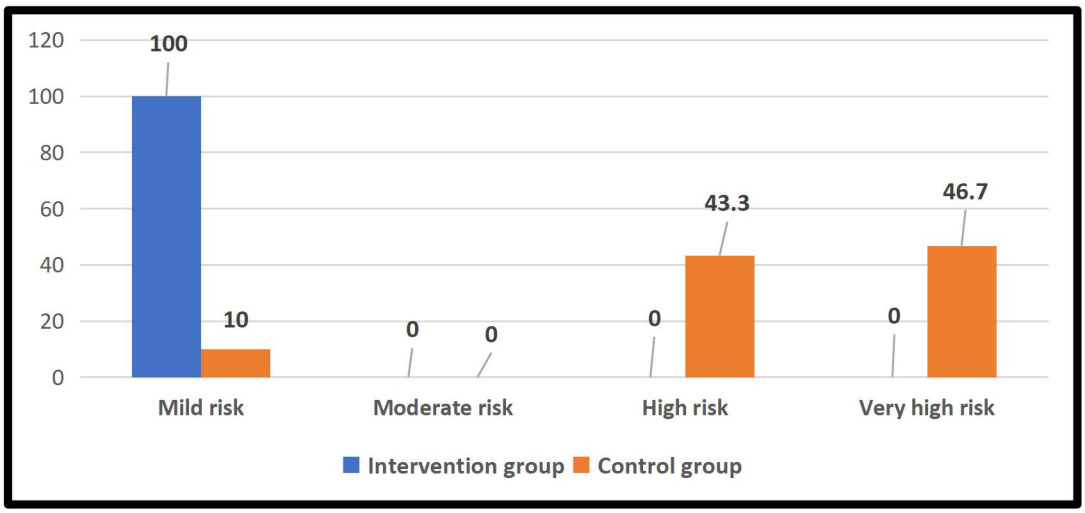

Figure 1: Distribution of both studied groups in compliance with pressure ulcer risk of incidence during 7th day after guidelines implementation control group (n=30) and intervention group (n=30).

Table 5: Comparing pressure ulcer data between both studied groups during various study periods Pre and post-guidelines implementation.

Study periods / Pressure ulcer data	Post guidelines (7th day) Intervention group n= 3 No (%)	Control group N= 14 No (%)	X^2-test P-value
Location:-			
1. Coccyx	1(33.3)	2(14.3)	1.403
2. Buttocks	2 (66.7)	8 (57.1)	0.496 n.s
3. Several sites	0 (0.0)	4 (28.6)	
Stage:-			
1. Stage I (non-bleachable erythema)	3 (100.0)	0 (0.0)	17.000
2. Stage II (partial thickness skin loss)	0 (0.0)	7 (50.0)	0.001**
3. Stage III (full thickness of skin loss)	0 (0.0)	4 (28.6)	
4. Stage IV (full thickness tissue loss)	0 (0.0)	3 (21.4)	
Exposed tissue:-			
1. 1Epidermis	3(100.0)	0 (0.0)	17.000
2. Dermis	0 (0.0)	7 (50.0)	0.001**
3. Subcutaneous tissue	0 (0.0)	4 (28.6)	
4. Fascia/muscles	0 (0.0)	3 (21.4)	
Exudate:-			
1. None	3 (100.0)	3 (21.4)	6.679
2. Mild	0 (0.0)	5(35.7)	0.035 *
3. Moderate	0 (0.0)	6 (42.9)	
1. Heavy	0 (0.0)	0 (0.0)	
Odor:-			1.987
1. Absent	3 (100.0)	8 (57.1)	FEP
2. Present	0 (0.0)	6 (42.9)	0.515 n.s

N.s: Significant > 0.05, * Significant at ≤0.05, ** highly statistically significant at ≤0.001
FEp: p value for Fisher exact for chi square

Table (6): Multiple Linear Regression Analyses for Predictor Variables of pressure ulcer risk of incidence among both intervention and control groups at 7th day post guidelines implementation

Predictor Variable of risk	Intervention group (n=3) Unstandardized Coefficients		Standardized Coefficients			Control group (n=14) Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.	B	Std. Error	Beta	t	Sig.
(Constant)	16.910	5.315		3.182	0.005	-3.076	5.598		-0.550	.588
Age	0.442	0.359	0.214	1.230	.233	2.403	0.830	0.496	2.897	.008
Gender	1.9976	0.958	.417	2.063	.052	3.103	1.316	0.392	2.359	.027
Diagnosis	0.240	1.039	.107	0.231	.820	2.221	1.239	0.558	1.793	.086
Treatment	-0.039	0.543	-.027	-0.072	.943	0.340	0.663	0.123	0.512	.614
ADLs	-0.625	2.211	-.084	-0.282	.780	-0.933	2.979	-0.071	-0.313	.757
Adjusted R^2= 0.726			**P = 0.043***			**Adjusted R^2= 0.689**			**P = 0.006***	

(ADLs) activity of daily living (**B**) Beta Co-Efficient (SEB) Standard Error

Discussion

Pressure ulcers described not only as one of the most expensive and physically devastating complications, but also considered the third most costly disorder following cancer and cardiovascular diseases. Each year, above one million patients have PUs. Moreover, nearly 57% to 60% of all pressure ulcers develop within hospitals (**Sabaq& Mohamed, 2018)**.

Efforts to prevent pressure ulcer development are plagued with inconsistencies and a general lack of best practice guidelines. Establishment of present practice approaches for the assessment, prevention, and management of pressure ulcers is a necessary first step in evidence-based/best practice guidelines implementation. **(Sayılan, 2019):** hence, the study intent to determine the impact of implementing evidence-based practices guidelines on immobilized orthopedic Patients' Outcome regarding Pressure Ulcers

Regarding personal data and medical history of the investigated patients, The present investigation indicated that more than a third of the study group and almost half of the control group were between the ages of thirty and forty. Regarding gender two third and more than half of both study and control groups, respectively, were males. Concerning diagnosis, almost half of both control and study groups had pelvic fracture and majority was dependent and had internal fixation.

These findings are similar to a study conducted by **Mohamed & Weheida, 2015** who reported that the age of the patients ranged from twenty to sixty years, more than two-thirds of them were males.

The current study illustrates that there were no statistically significant (P>0.05) between both studied groups regarding skin characteristics at pre-guidelines implementation, but there were highly statistically significant at P ≤0.001 between both studied groups regarding skin temperature, color and moisture at post-guidelines implementation (7 th day). It also denotes that there were highly statistically significant at P ≤0.001 regarding pressure ulcer stage and exposed tissue. Moreover, there were statistically significant in pressure ulcer exudate at P ≤ 0.05 Whereas, there were no statistical significant in pressure ulcer location and odor at P>0.05.

These results were supported by a study conducted by **Mohammed, et al., 2018** who noted that, regarding moisture, On the 1st & 2nd days, there was no statistically significant variation between the study and control groups, whereas there was a statistically significant variation between the two groups on the third 3rd day, and a highly statistically significant variation between the two groups on 4th - 7th days.

In compliance with comprehensive skin assessment regarding temperature, this conclusion is compatible with **Yusuf et al.** (2015), who suggested that localized skin heat can predict PU progression. They discovered a significant variation in total skin temperature between the group that suffered from pressure ulcers and the group that did not. This can be described as follows: heat can build up between the mattress and the patient's skin when standard hospital mattresses that have plastic coverage are utilized.

Regarding skin integrity, the current study revealed that, at the 7th day, pressure ulcers developed in one-third vs. almost half of the study and control groups, respectively, which was influenced by the study group's application of evidence-based practises guidelines. The current study presents that pressure ulcer risk of incidence was best predicted by gender (p= 0.052*) among intervention group accounting for 72.6 % of the variance in risk of incidence and both age and gender among control group (p= 0.008*& 0.027*, respectively), accounting for 68.9 % of the variance in risk of incidence.

Campbell et al., 2010) confirmed this finding, stating that the PUs incidence following the application of the preventative

program was statistically significant when compared to the pre-intervention incidence. This similarity in findings might be as a result of similarities in preventative nursing care.

The Braden Risk Assessment Scale was utilized for evaluating if individuals were at risk of having a pressure ulcer in the current study (BRAS). **In compliance with Braden risk assessment subscales,** the current study illustrates that there were highly statistically significant at P ≤0.001 regarding the difference in pressure ulcer risk between control and intervention groups during the 2nd, 6th and 7th days. In addition, there were statistically significant at P ≤ 0.05, regarding the difference in pressure ulcer risk between control and intervention groups during the 3rd, 4th and 5th days. Whereas, there were no statistical significant at P>0.05 regarding the difference in pressure ulcer risk between control and intervention groups during 1st day.

The current study also indicated that all study group patients had a mild risk of pressure ulcer incidence during 7th day after guidelines implementation. While, almost half of control group had high and a very high risk of incidence of pressure ulcers. This result proved that implementing evidence-based practices guidelines had a positive effect on patients' outcome in terms of decreasing the risk of exposure to pressure injury**.** Research hypothesis was supported based on these findings.

This findings is congruent with that of **Mohamed and Ibraheem, 2019,** who discovered that more than one-third of the control and study groups were at increased risk upon admission, whereas after two weeks, almost one-third and one-fourth of the study group were at moderate risk and mild risk, respectively.

The present study demonstrated that there was a highly statistically significant difference in all subscales of the Braden risk assessment for pressure ulcers between both investigated groups at P ≥0.001. **Mohamed & Weheida, (2015)** confirmed the present study's findings, stating that the most individuals at risk of developing pressure ulcers according to the Barden scale's overall score. The score increased after applying the program on five and ten day.

Conclusions

It was concluded, depending on the findings of the current investigation, that:

Implementing evidence-based practises guidelines significantly improved the pressure ulcers in orthopedic immobilized patients' outcome in comparison with orthopedic immobilized patients receiving normal nursing care.

Recommendations

The following suggestions can be made on the basis of the findings of this study:

- Preventative interventions such as skin care, diet, mobility, and position modification should be done effectively in collaboration with patients identified as at risk for pressure ulcers.

- Additional research or study is required for identifying barriers to the application of pressure ulcer prevention procedures.

- Nursing care recommendations for the prevention of pressure ulcers must be reviewed on a regular basis and be available in both Arabic and English.

- There is a necessity for establishment of an in-service training programme for nursing staff, since this is required for the continuously progressing care for patients in this region.

Study drawbacks

Since the sample was chosen from a single geographical region in Egypt, generalisation was constrained.

Credit authorship contribution statement

Doaa Mohamed Mahmoud: conceptualization, methodology, data curation, formal analysis & writing; **Eman Sobhy Omran:** methodology, resources, formal analysis, writing & editing.

Declaration of Competing Interest

The authors announce that they are unaware of any competing financial interests or personal connections that may have impacted or be considered to have influenced the work reported in this publication.

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