

Effect of Nurse Driven Skin Care Bundle on Hospital Acquired Pressure Injury among Immobilized Patients with Orthopedic Disorders

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Abstract

Background: Pressure injury has a significant danger among immobilized patients with orthopedic disorders and consider a clinical challenge for nurses and other healthcare professionals globally. **Aim:** to determine the effect of nurse driven skin care bundle on hospital acquired pressure injury among immobilized patients with orthopedic disorders. **Design:** A quasi-experimental design, two groups(study/control) was used. **Setting:** The study was conducted in the orthopedic department at Menoufia University Hospital. **Subjects:** A consecutive sample of 118 immobilized adult patients of both genders. **Instruments:** Instrument I: Structured Interview questionnaire, Instrument II: Comprehensive skin assessment observation checklist, Instrument III: Braden Risk Assessment Scale. **Results:** It was described that 49.2% of the study group and 35.6% of the control group was in the category of age between 50 < 60 years old and around half of both study and control groups (50.8% and 54.2% respectively) was male. There was a significant statistical difference between the study and the control group related to the occurrence of hospital acquired pressure injury post intervention with ($p < 0.001$). **Conclusion:** a nurse driven skin care bundle had a positive significant effect on preventing hospital acquired pressure injury among immobilized patients with orthopedic disorders. **Recommendations:** patients with orthopedic disorders should be oriented to identifying and reporting any changes in their skin condition. Collaborating with other institutions to implement nurse driven skin care bundle as a preventive measure to reduce the incidence of hospital acquired pressure injury among immobilized patients with orthopedic disorders.

Key words: immobilized patients with orthopedic disorders, Nurse driven, Pressure injury, Skin care bundle

Introduction:

Pressure injuries (PIs), which affect thousands of patients annually, presented a serious risk to patients and a therapeutic challenge to nurses and other clinicians worldwide. It could be the most threat to a patient's life or at the very least, to his or her comfort and well-being. These are localized lesions of the skin and/or surrounding tissues that frequently happen around bony prominences or are connected to a medical device (Cruz, 2020).

Its global prevalence is 12.8% among adults. Despite advancements in medical technology, it is most common among hospitalized patients, particularly those in the intensive care unit (ICU), and accounts for 14%–42% of global mortality. Furthermore, within a year of hospital discharge, the mortality rate among older persons increased by 60% as a result of PIs (Li et al., 2020).

The risk factors of PIs may be intrinsic or extrinsic. Intrinsic factors include

immobility, poor nutrition, sensory impairment, incontinence, and co-morbidity such as diabetes. External factors include compression from any firm surface friction from the immobilized patient and wetness from the bowel or bladder. Among immobilized patients with orthopedic disorders who are unable to move or spend most of their time in a bed or chair are at greater risk of pressure injury. It happens when there is severe, continuous pressure, or pressure combined with shear (Payne, 2020).

Immobility could developed decubitus ulcer after two hours among a bedridden patient or patient who undergoing surgery. It may also occur on by a badly fitting casts or other medical supplies. Mucosal pressure damage could also occur by medical instruments (Nadukkandiyil et al., 2021).

The PIs may be painful and manifested as intact skin or as an open ulcer. Although the following are among the early indications of pressure ulcers which the patients and care provider should noticed: Clinical signs of an

ulcer include redness, warmth, spongy or hard skin, erosion of the upper layers of skin, or a sore with bacterial infiltration. They begin with a slight increase in skin redness and progress to tissue damage, infection, as well injury to muscles and bones also could occur (**Brock, 2022**).

Pressure injury development is usually prone to occur in the skin covering the ischial tuberosity, sacrum, heels of the feet, tops of the long bones of the foot, buttocks, over the shoulder, and over the back of the head. Pressure ulcers have a negative consequence on quality of life, and are expensive to treat (**Zhu et al., 2023**).

A care bundle is a group of nursing care for a specific individual patient, all of which are clinically proven to improve immobilized patient outcomes. The care bundle approach is frequently used in the clinical setting because it often depends on the best evidence and has been revealed to be beneficial for patients (**Zhang et al., 2021**). The skin care bundle considered a crucial prevention strategy for PIs progress, such as nursing clinical assessment and documentation, hygienic measures, patients repositioning, nutrition and hydration therapy for immobilized patients with orthopedic disorders (**Xiaodan and Lipeng, 2021**).

Significance of the study:

Pressure injury is an important health problem for different patients especially immobilized patients with orthopedic disorders. Worldwide the prevalence rate of PIs was 18% (**Asadi et al., 2023**). It has a negative consequence on patients' comfort and quality of life. Since immobility is the major important predictors for developing a pressure injury, the immobilized patients with orthopedic disorders are more vulnerable to develop pressure injury with prevalence rates ranged from 13.9 % to 29 % (**Mahmoud and Omran, 2022**). Moreover, the flow rate of immobilized patients with orthopedic disorders to Menoufia University Hospital in 2023 is about 17 cases monthly (**Statistical records of surgery, Menoufia University Hospital, 2023**). However, pressure injury is still a significant health problem for immobilized patients with orthopedic disorders

who require comprehensive skin care to decrease risk for developing pressure injury. So health care team especially nurse had a chief and a key role in preventing pressure injuries development by applying the skin care bundle to decrease the risk of developing pressure injuries and improve the excellence of care. Therefore, the current study determined the effect of nurse driven skin care bundle on hospital acquired pressure injury among immobilized patients with orthopedic disorders.

Aim of the study

To determine the effect of nurse driven skin care bundle on hospital acquired pressure injury among immobilized patients with orthopedic disorders.

Research hypotheses

1. The immobilized patients with orthopedic disorders who are receiving nurse driven skin bundle (study group) will have less incidence of hospital acquired pressure injury than the control group.

Methodology

Research design:

The current study used a quasi-experimental design with two groups (study/control).

Setting:

The study was conducted in the orthopedic department (which exists on the 6th floor of the university hospital), it consisted of 2 partitions (one for female and the other for male) at the Menoufia University Hospital in Shebin El -Kom, Menoufia Governorate, Egypt.

Sample

A consecutive sample of 118 adult who was selected from immobilized patients with orthopedic disorders from all genders. The sample was divided randomly into two equal groups (59 patients in each group). The sample size was chosen according to power analysis equation.

Sample size calculation:

The study sample was statistically premeditated based on review of past literature (Mayhob and Abdelsalam, 2021). The sample was calculated at power 80% and confidence level 95%, with the following equation: Sample Size Formula = $[z^2 * p (1-p)] / e^2 / 1 + [z^2 * p (1-p)] / e^2 * N]$

Where,

- N is the population size
- z is the z-score
- e is the margin of error
- p is the standard of deviation
- Confidence level = 95%
- Standard Deviation = 50%
- Margin of error = 5%
- The z-score will be 2.58 if the confidence level is 99%
- This means that: N = 168, z = 1.96, e = 0.05 and p = 0.5
- So total calculated sample size was 118

Inclusion criteria:

- Adults patients from both gender.
- Immobilized patients with orthopedic disorders.

Exclusion criteria:

- Patients with pressure ulcers.
- Patients suffering from any peripheral vascular complications, because these complications would affect the results of the present research.
- Medically unstable patients
- Un cooperative patients

Instruments of the study:

The data for this study was gathered using three instruments:

Instrument (I): Structured Interview questionnaire:

It was developed by researchers after reviewing the related literature to evaluate demographic and medical data. It has been split into two parts:

- Part (I): patients' demographic It assess information about the patients, such as their age, gender, marital status, educational level, employment, and residence.
- Part (II): patients' medical data: it includes patient's medical diagnosis, current medical management, and presence of co morbidity.

Instrument (II): Comprehensive skin inspection checklist:

It was adapted from Berkshire Healthcare NHS Foundation Trust, (2021) and used to assess skin state that included skin temperature, skin color, moistening status of the skin, skin turgor and skin intact. Also, it assess pressure ulcer sites that includes buttocks, elbows/ ears, sacral area, heels, trochanter (hips), spine /shoulder, and occipital/back of head. Also it determined the pressure ulcer stages that categorized to four stages; stage (I) represented non-blanchable erythema, with intact skin surface; stage (II) reflected epithelial damage, abrasion or blister; stage (III) mean damage to the full thickness of the skin without a deep cavity and stage (IV) mean damage to the full thickness of the skin with deep cavity.

Instrument (III): Braden Risk Assessment Scale:

It was adopted by (Mohamed and Ibraheem, 2019; Mohammed, et al., 2018; Mohamed and Weheida, 2015) to ascertain the patient's risk for pressure ulcers. It was divided into six subscales: sensory perception, skin moisture, activity, mobility, nutrition, and friction/shear. The scoring system of the Braden risk assessment scale: The six subscales were rated from 1(least impaired) to 4 (most impaired), with the exception for friction and shear, which were scored from 1 to 3. All items were summed up to give the overall score of the scale from 6 to 23. The lower the score, the more

susceptible the skin to breakdown. The overall score was divided into the following categories: score ≤ 9 indicated a very high risk of developing pressure ulcers; score (6–12) indicated a high risk; score (13–14) indicated a moderate risk; score (15–18) indicated a mild risk; and score (19–23) indicated no risk.

Validity and reliability of the study instruments:

Validity: A panel of five experts from Menoufia University's medical surgery nursing department and nursing faculty evaluated the validity of the instruments to create the final and valid version of them. Changes were made in accordance with the panel's conclusions regarding the content's completeness, appropriateness, and sentence clarity.

Reliability: The internal consistency of the proposed instruments was evaluated by using Cronbach's alpha test to determine their reliability. The reliability of the comprehensive skin assessment instrument was evaluated by Mobed et al., 2022 and it was 0.87. Lima-Serrano et al., (2018) evaluated the reliability of the Braden Risk Assessment Scale and it was 0.98.

Pilot Study: In order to assess the clarity, applicability, and time needed to fill in the instruments for data collection, a pilot study was conducted after the instruments were developed, but before starting the data collection. 10% of the sample (n=12) they were excluded from the main study sample and enrolled in the pilot trial. A few adjustments were made in accordance with the results of the pilot study.

Ethical consideration

- A written informed consent was taken from each patient after clarifying the research aim and benefit of the research.
 - Confidentiality and anonymity of patients' information was assured through coding all data and put all the paper in a secured closed cabinet.
- Data collections:**
- Data was collected over four months, from commencement of May to the termination of August 2023.
 - Patients who met the inclusion criteria and decided to participate in the study were randomly and alternatively allocated into two equivalent groups. Each group is composed of (59) patients.
 - The researchers coordinated with the orthopedic department head nurses to notify them of newly admitted patients who satisfied the inclusion criteria during the first 24 hours from the patient's admission. This was accomplished by notifying them on the designated admission day for patients who were admitted with significant orthopedic conditions.
 - Consequently, researchers interviewed every participant in the two groups individually immediately after his/her admission to the orthopedic department and assessed patients' demographic, medical data, observing skin and determined their risk factors for developing pressure injury using instrument I, II and III. All instruments took about 40–50 minutes to fill in.
 - The researchers began implementing the skin care bundle elements to study group through teaching patients and caregiver in two sessions. Each one took about 45–60 minutes according to patients' and care givers' understanding.
 - The first session contained the theoretical part like the function of the skin, potential risks of skin breakdown, knowledge about healthy nutrition that contained all components of food (proteins, fats, carbohydrates, vitamins, and minerals), briefly mentioned the food pyramid and

offered him some instances of distinctive quantities from each shelf of the food pyramid and ensured that the patient consumes enough fluids (2.5 L daily).

- In the second session, the researchers demonstrated and re-demonstrated the practical procedures for patients and caregiver, which included examine skin over bony prominence areas in the body at different body positions (supine, prone and lateral position), repositioning patient every 2 hours. Tension-free techniques were implemented to help turn patients as gentle as possible to avoid dragging, pulling, and other violent behaviors. How to apply supportive measures, such as placing a small pillow on the patient's back. The heels were raised for greater comfort position. Patients were advised to use handheld devices (such as trapeze bar or bed linens to help to lift and reposition. An air mattress was utilized according to patient capabilities, also the researchers focused on keeping the pony prominent areas in the body healthy through frequent massage over it by moistening lotion free from alcohol to avoid skin dryness, in addition to keep bed linen dry, clean and free from wrinkles.
- Control group received the routine hospital care that included administration of prescribed medication to patient and bed making.
- All patients were carefully evaluated and followed up 3 times (pre intervention at the 1st day of admission, post intervention after the 3rd day then follow up assessment done after the 7th day). For both group the patients were assessed through direct patients' observation.

Statistical analysis

An IBM personal computer running SPSS version 20 (SPSS, Inc., Chicago, Illinois, USA) was used to gather, tabulate, and statistically analyze the data. The following statistics were used

Descriptive statistics: The quantitative data were offered in the form of mean, standard deviation (SD) and qualitative data were

presented in the form of numbers and percentages.

Analytical statistics: used to determine whether the research variables and the targeted disease may be related. The following significance tests that were used:

- **Chi squared test:** is a statistical test of significance applied to compare two groups with qualitative variables.
- **t-test:** is a test of significance used for comparison between two groups normally distributed having quantitative variables.

Results

Table (1) showed the distribution of demographic information of the studied sample. It was described that 49.2% of the study group and 35.6% of the control group was in the category of age between 50<60 years old. Regarding gender around half of both study and control group was male (50.8% and 54.2%) respectively. In relation to marital status most of the study and the control group was married. In terms of education, it was discovered that about one third of the study and the control group had completed secondary school. Concerning employment 37.3% of the study group was housewife and worker while in the control group 35.6% was housewife and 40.7 was worker. More than half of both groups coming from rural area. There was no statistically significant difference between the study and the control group regarding their demographic information. So they were homogenies groups.

Table (2) displayed the distribution of the examined sample's medical data. It was discovered that the fracture femur were among more than half of the study group (72.9%) and while among the control group were 67.8%. About 67.8% and 67.8% of the study group and control group respectively, experienced internal fixation in response to current medical management. Related to presence of comorbidity about (42.4%) and (40.6%) among both groups respectively had hypertension. There was no statistically significant difference between the study and the control group regarding their medical data.

Table (3) described the comparison between the study and the control group regarding their mean score of Braden scale sub items at different interval. It showed that there was statistically significant difference between the study and the control group regarding moisture, activity and mobility at the 3rd day post intervention with p value= (0.003, 0.030, and 0.037) respectively. Also there was statistically significant difference regarding the sensory perception, nutrition, and friction and shear with p value < 0.001. While at the 7th day after implementation of the intervention, all of the Braden scale sub-items (sensory perception, moisture, activity, mobility, nutrition, and friction & shear) showed a statistically significant difference between the study group and the control group.

Figure (1) revealed the comparison between the study and the control group regarding their severity level of Braden scale pre and post-intervention at different interval. As evidenced from that figure more than half of the study group (64.4%) had very high risk of pressure injury pre-intervention that decreased to (25.4%) at the 3rd day post-intervention and (3.4%) at the 7th day post-intervention while patients among the control group (64%, 50.8%, and 35.6%) of them had very high risk of pressure injury at pre-intervention, the 3rd and the 7th day post-intervention respectively.

Figure (2) showed the comparison between the study and the control group regarding their stages of pressure injury pre and post-intervention. It described that there was statistical significant difference between the study and the control group in relation to stages of pressure injury post-intervention of the study group at the 3rd and the 7th day.

Table (4): compared the pressure injury indicators at the 3rd and the 7th days post-

intervention between the study group and the control group. At the 3rd day post-intervention, there was statistically significant difference in terms of redness/erythema, non-blanching persistent erythema/redness, pain/soreness, warmer/cooler over bony prominence, spongy feeling, and discoloration between the study group and the control group. Whereas at the 7th day post intervention there was statistically significant difference between the study and the control group regarding to pressure injury indicators for redness/erythema, pain/soreness, warmer/cooler over bony prominence, spongy feeling, hardened, discoloration, and broken skin.

Figure (3) revealed comparison between the study and the control group regarding their body areas of pressure injury pre and post-intervention. About (20.2%) of the study subjects had buttock ulcer compared to (47.5%) of subjects among the control group at 3rd day post-intervention. Regarding to buttocks ulcer there was an improvement among the study group as the number of ulcer decrease to (6.8%) while (52.5%) among the control group 7th day post-intervention. There was statistically significant difference between the study and the control group post- intervention at (the 3rd and the 7thday) regarding body areas of pressure injury.

Table (5) clarified the relation between severity level of Braden scale and medical data of the studied sample at the 7th day post-intervention. There was statistically significant relation between severity level of Braden scale and current medical management while medical diagnosis and presence of comorbidity showed no statistically significant relation between severity level of Braden scale at the 7th day post-intervention.

Table (1): Distribution of demographic information of the studied sample (N=118).

Demographic Information	Study group (N=59)		Control group (N=59)		X ²	P value
	No.	%	No.	%		
Age						
- 20 <30	7	11.9	15	25.5	4.276	0.233
- 30 <40	12	20.3	11	18.6		
- 40 <50	11	18.6	12	20.3		
- 50 <60	29	49.2	21	35.6		
Mean + SD	46.97±12.37		46.83±12.39		t.test= 0.060	0.953
Gender						
- Male					0.136	0.712
- Female	30	50.8	32	54.2		
	29	49.2	27	45.8		
Marital status						
- Married	55	93.3	57	96.6	0.702	0.340
- Widow	4	6.7	2	3.4		
Educational levels						
- Illiterate	12	20.3	12	20.3	0.201	0.977
- Primary education	15	25.5	17	28.8		
- Secondary education	22	37.3	21	35.6		
- University education	10	16.9	9	15.3		
Employment						
- Housewife	22	37.3	21	35.6	0.150	0.985
- Worker	22	37.3	24	40.7		
- Employee	13	22.0	12	20.3		
- Retired	2	3.4	2	3.4		
Residence						
- Rural	40	67.8	42	71.2	0.160	0.842
- Urban	19	32.2	17	28.8		

Table (2): Distribution of medical data among studied sample (N=118).

Medical data	Study group (N=59)		Control group (N=59)		X ²	P value
	No.	%	No.	%		
Medical diagnosis						
- Fracture femur	43	72.9	40	67.8	1.367	0.505
- Joint dislocation	12	20.3	10	16.9		
- Several fracture	4	6.8	9	15.3		
Current medical management						
- Internal fixation	40	67.8	40	67.8	0.722	0.868
- External fixation	6	10.2	6	10.2		
- Cast	10	16.9	8	13.5		
- Traction	3	5.1	5	8.5		
Presence of comorbidity						
- No	15	25.4	17	28.8	0.178	0.981
- Hypertension	25	42.4	24	40.6		
- Diabetes mellitus	16	27.1	15	25.5		
- Liver disease	3	5.1	3	5.1		

Table (3): Mean value of Braden scale sub items score among studied participant at different intervals (N=118).

Braden scale sub items	Study group (N=59)			Control group (N=59)			t-test	P value
	1 st day	3 rd Day	7 th day	1 st day	3 rd Day	7 th day		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Sensory perception	1.90 ±0.96	2.68±0.99	3.10 ±0.80	1.85 ± 0.99	2.00 ±0.91	2.10 ± 0.95	0.28 3.67 6.14	P1: 0.78 P2:<0.001** P3:<0.001**
Moisture	1.61±0.74	2.24 ±0.70	3.03± 0.89	1.64 ± 0.74	1.71 ±0.77	2.10 ± 0.96	0.25 3.00 5.47	P1: 0.80 P2:0.003* P3:<0.001**
Activity	1.71±1.07	2.08±1.00	2.51± 0.86	1.61± 0.97	1.73± 0.94	1.90 ±1.02	0.53 2.20 3.50	P1: 0.59 P2:0.030* P3:0.001*
Mobility	1.66±0.92	2.02 ± 0.82	2.44±0.67	1.58±0.85	1.69±0.83	1.85±0.88	0.52 2.11 4.09	P1: 0.61 P2:0.037* P3:<0.001**
Nutrition	1.76±0.75	2.79±0.90	3.30 ± 0.53	1.78 ±0.72	1.98±0.84	2.19±0.79	0.13 5.06 8.95	P1: 0.90 P2:<0.001** P3:<0.001**
Friction and Shear	1.33±0.47	2.02±0.57	2.47±0.56	1.39±0.49	1.52±0.56	1.69±0.56	0.57 4.68 7.48	P1: 0.57 P2:<0.001** P3:<0.001**

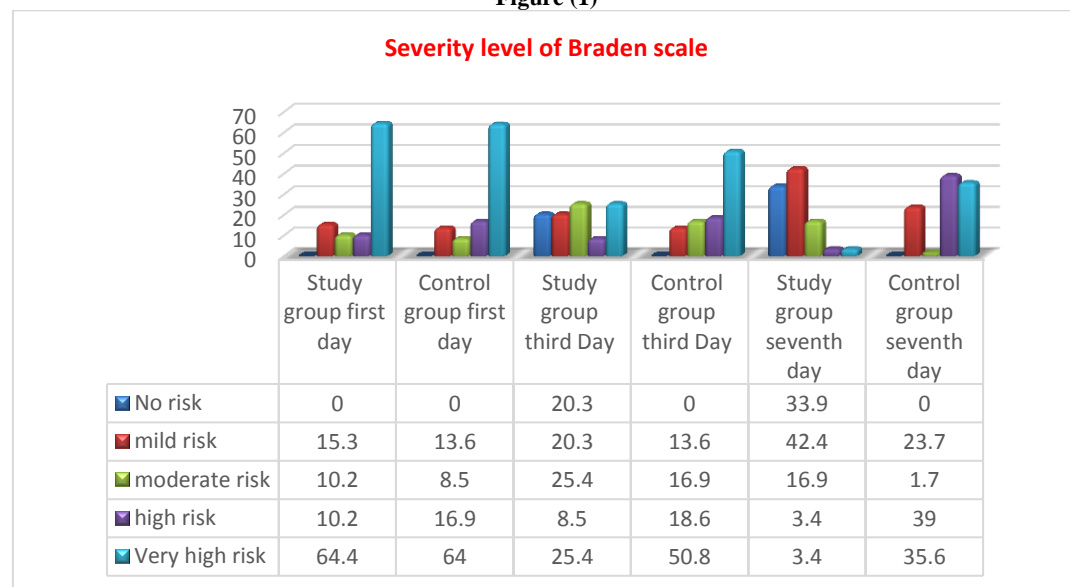
*Significant< 0.05 ** Highly significant<0.001

P1: Comparison between study and control group at the 1st day

P2: Comparison between study and control group at the 3rd day

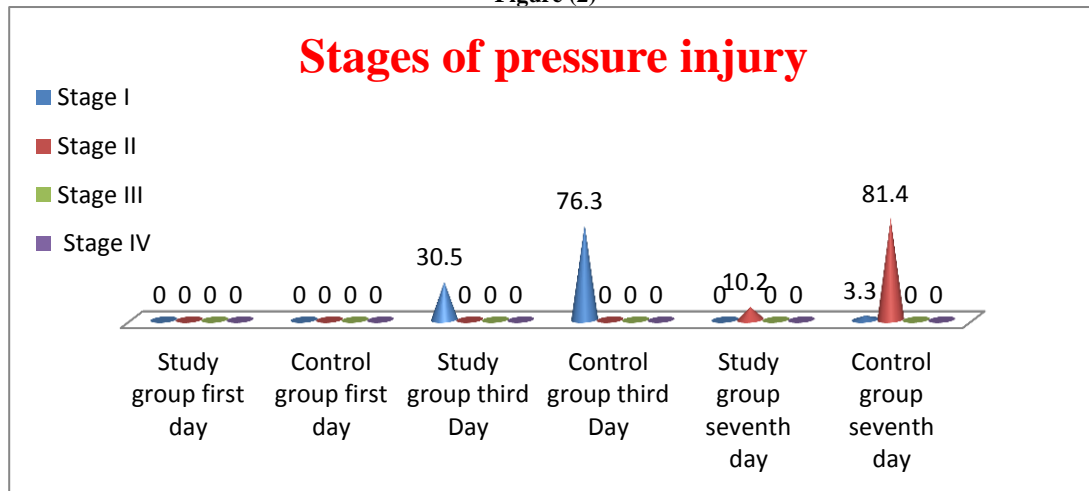
P3: Comparison between study and control group at the 7th day

Figure (1)



Comparison between the study and the control group regarding their severity level of Braden scale at pre and post-intervention

Figure (2)



Comparison between the study and the control group regarding their stages of pressure injury at pre and post-intervention (N=118).

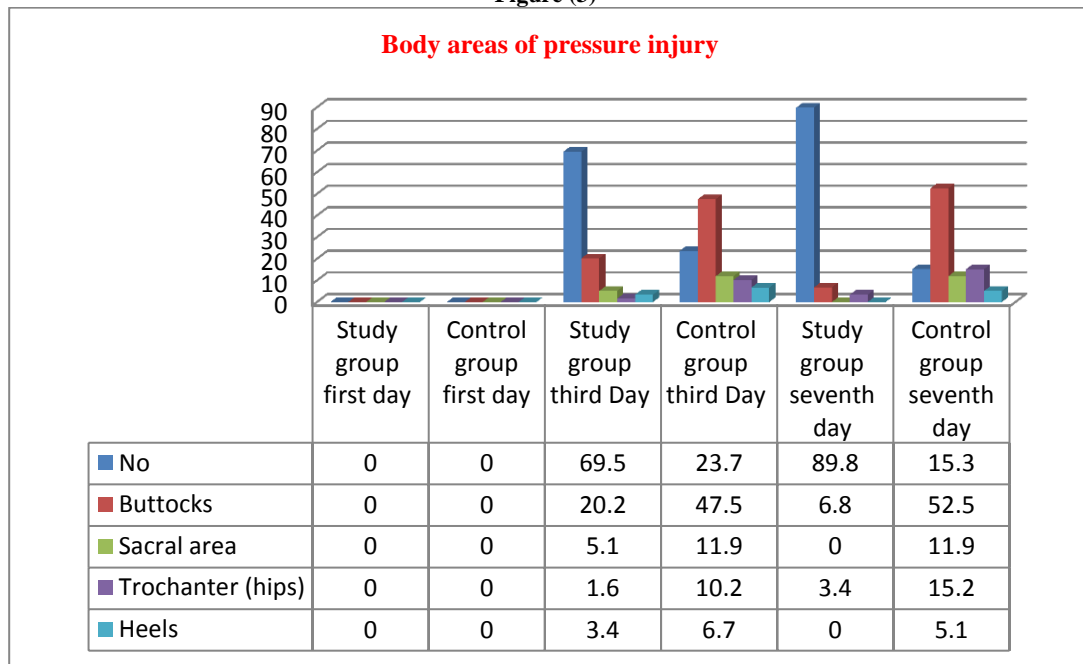
Table (4): Pressure injury indicators at the 3rd and the 7th days post-intervention between the study and the control group (N=118).

Pressure injury indicators	Study group (N=59)				Control group (N=59)				X ²	P
	3 rd day		7 th day		3 rd day		7 th day			
	No.	%	No.	%	No.	%	No.	%		
Redness / erythema										
- Yes	18	30.5	6	10.2	55	93.22	41	69.5	49.18	P1: <0.001**
- No	41	69.5	53	89.8	4	6.78	18	30.5	43.32	P2: <0.001**
Non-blanching persistent erythema										
- Yes	18	30.5	0	0.00	41	69.5	2	3.39	49.18	P1: <0.001**
- No	41	69.5	59	100.0	18	30.5	57	96.61	2.034	P2: 0.154
Pain / soreness										
- Yes	18	30.5	6	10.2	55	93.22	41	84.7	46.62	P1: <0.001**
- No	41	69.5	53	89.8	4	6.78	18	15.3	43.32	P2: <0.001**
Warmer / cooler over bony prominence										
- Yes	18	30.5	6	10.2	55	93.22	41	84.7	49.18	P1: <0.001**
- No	41	69.5	53	89.8	4	6.78	18	15.3	43.32	P2: <0.001**
Spongy feeling										
- Yes	18	30.5	0	0.00	45	76.27	2	3.3	49.18	P1: <0.001**
- No	41	69.5	59	100.0	14	23.73	57	96.7	4.140	P2: 0.042*
Hardened										
- Yes	2	3.3	0	0	4	6.78	2	3.3	0.702	P1: 0.402
- No	57	69.7	59	100	55	93.22	57	96.7	4.140	P2: 0.042*
Discoloration										
- Yes	18	30.5	6	10.2	4	93.22	41	84.7	49.18	P1: <0.001**
- No	41	69.5	53	89.8	55	6.78	18	15.3	43.32	P2: <0.001**
Broken skin										
- Yes	0	0	6	10.2	0	0	38	64.41	-	P1: -
- No	59	100	53	89.8	59	100	21	35.59	37.11	P2: <0.001**
Devices used										
- No	16	27.12	20	33.90	15	25.42	18	30.51	0.189	P1: 0.919
- Catheters	27	45.76	21	35.59	26	44.07	25	42.37	0.571	P2: 0.752
- Splints	16	27.12	18	30.51	18	30.51	16	27.12		

*Significant < 0.05 **Highly significant <0.001 P1: Comparison between study and control group at the 3rd day

P2: Comparison between study and control group at the 7th day.

Figure (3)



Comparison between the study and the control group regarding their body areas of pressure injury at pre and post-intervention (N=118)

Table (5): Relation between severity level of Braden scale and medical data among the study and the control group at the 7th day post-intervention (N=118).

Medical data	Study group (N=59)					Control group (N=59)				X ² P value
	No risk	mild risk	Moderate	high risk	Very high risk	mild risk	Moderate	high risk	Very high risk	
	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	
Current medical diagnosis										
-fracture femur	14(23.6)	18 (30.5)	7 (11.9)	2 (3.4)	2 (3.4)	6 (10.2)	1 (1.7)	19 (32.2)	14(23.6)	1.895 0.116
-joint dislocation	4 (6.8)	5(8.5)	3 (5.1)	0 (0.00)	0 (0.00)	1 (1.7)	0 (0.00)	1 (1.7)	5 (8.5)	
-several fracture	2 (3.4)	2 (3.4)	0 (0.00)	0 (0.00)	0 (0.00)	7 (11.9)	0 (0.00)	4 (6.8)	2 (3.4)	
Current medical management										
-internal fixation	1 (1.7)	25 (42.4)	10 (16.9)	2 (3.4)	2 (3.4)	0(0.00)	1 (1.7)	18 (30.5)	21 (35.6)	16.577 <0.001**
-external fixation	6 (10.2)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	3 (5.1)	0 (0.00)	0 (0.00)	0 (0.00)	
-cast	10 (16.9)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	7 (11.9)	0 (0.00)	3 (5.1)	0 (0.00)	
-traction	3 (5.1)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4 (6.7)	0 (0.00)	1 (1.7)	0 (0.00)	
Presence of comorbidity										
- No										0.864 0.488
- Hypertension	4(6.8)	7(11.8)	4 (6.7)	0 (0.00)	0 (0.00)	1 (1.7)	0 (0.00)	9 (15.3)	7 (11.9)	
-Diabetes Mellitus	9 (15.3)	10 (16.9)	3 (5.1)	2 (3.4)	1(1.7)	6 (10.2)	1(1.7)	8 (13.4)	9 (15.3)	
	5 (8.5)	3 (5.1)	0 (0.00)	0 (0.00)	1(1.7)	6 (10.2)	0 (0.00)	5 (8.5)	4 (6.7)	
-Liver disease	2 (3.4)	7 (11.9)	0 (0.00)	0 (0.00)	0 (0.00)	1 (1.7)	0 (0.00)	1 (1.7)	1 (1.7)	

Discussion

Hospital pressure injury is still a major issue that thought to be serious health problems that affects patients as well as the healthcare system. Pressure ulcers that developed in hospitals are issues that were acquired there. The use of preventative strategies is still subpar despite mounting evidence and guidelines for the prevention of pressure ulcers. One such strategy is the care bundle, which thought to be the most well-organized collection of interventions that promote adherence to its components in order to stop the development of pressure ulcers and enhance the delivery of high-quality care (Mayhob and Abdelsalam, 2021)

In general, the current study found that the skin care bundle had a statistically significant beneficial effect on decreasing hospital acquired pressure injury among immobilized patients with orthopedic disorders.

Demographic data of the studied sample

The present study revealed that the gender and marital status, around half of the study and control group were males and the majority of them were married this finding was matched with the finding of a study done by Mobed et al., (2022) who mentioned that the majority of the patients were men and married. However, Cruz (2020) stated that more than half of the sample were female. Researchers have clearly shown that men were more likely to be involved in car accidents than women.

In relation to current medical management, more than half of investigated patients had internal fixation among the study and control group. These results were parallel to a study conducted by Mahmoud and Omran (2022) who reported that the majority of the sample was dependent and had internal fixation. Moreover, the current study showed more than half of study and control group had fracture femur, which in turn make them subjected to sustained static, also friction and shear were the most serious elements among the pressure ulcer development. This result was in the same line with Abdel Mowla et al., (2022) who found that more than half of the control group had fracture femur and more than one third of

patients among the study group had fracture femur and hip.

The result of the present study revealed that, there was no statistically significant difference between studied groups regarding their demographic characteristics & medical data at baseline. This required to guarantee that the two groups could be compared and to demonstrate that the two groups' randomization had been successful done. This was consistent with the finding of a study done by Mayhob and Abdelsalam (2021) who stated that the studied groups didn't differ significantly at the baseline regarding bio-sociodemographic characteristics, that it is importance to prevent bias on the variable which affected the study results, and make sure that both groups were equal before the experiment begins.

In the current study, people's risk to develop pressure ulcer was assessed using the Braden Risk Assessment Scale (BRAS). According to the subscales used for the Braden risk assessment, the current study discovered that, in terms of the overall mean score of the Braden Scale before intervention, there was no statistically significant difference between the study and the control group; however, there was a statistically significant difference after the third and seventh days post-implementation of the intervention. These results were similar to the finding of a study conducted by Mahmoud and Omran (2022) who represented that there were statistically significant regarding the difference of pressure ulcer risk between both groups during the 2nd, 6th and 7th days. In addition, there was statistically significant regarding the difference in pressure injury risk between both groups during the 3rd, 4th and 5th days. However, there were no statistically significant regarding the difference of pressure ulcer risk between both groups during the 1st day.

The results of the existing study showed that there was a significant statistical reduction of pressure injury risk score post-intervention than pre-intervention. This supported by other studies conducted by Khojastehfar et al., (2020) who informed that the implemented nursing interventions (which included preparing the patient's bed, moving the

patient, providing nutritional support, and providing skin care) were successful reducing the occurrence of pressure ulcers. Also in a study conducted by **Mobed et al., (2022)** mentioned that there was statistically significant difference between study and control group after intervention implementation regarding skin character around bony prominent.

As well, a study conducted by **Pachá et al., (2018)** reported that no evidence that nursing interventions had an effect of the investigation of the presence of pressure ulcers, this finding was in difference with the current study findings. The diverse study designs and healthcare settings may be to blame for these variations in prevalence rates.

In the present study the results found that there was statistically significant difference between study and control group regarding severity risk for occurrence of pressure ulcer where about one third of the study group had very high risk at the 3rd day that decreased to little percent at the 7th day post-intervention as compared to half of the control group patients who showed very high risk at the 3rd day and one third at the 7th day. The study's results are almost identical to a study published by **Mahmoud & Omran in 2022**, who noted that all study group patients had a slight chance to develop pressure ulcers on the seventh day following the application of the instructions. While almost half of the control group had high and very high risk for incidence of pressure ulcers.

These findings also paralleled with those of **Mohamed and Ibraheem (2019)** who discovered that more than one-third of the control and study groups were admitted with increased risk, whereas after two weeks, approximately one-third and one-fourth of the study group were at moderate risk and mild risk, respectively.

This result proved that implementing the bundle of skin care guidelines had a positive effect on patients' outcome in terms of decreasing the risk of exposure to pressure injury.

Also in study done by **Zhang et al. (2021)** who have verified that implementation

of care bundle elements could decrease the frequency and severity of pressure ulcers. These findings were corroborated with the current study findings.

The current study result was in contrast with **Sayan et al., (2020)** who found that, since there was no risk of pressure ulcer on admission among either patient group, the risk of developing pressure injury among the control group after two weeks of using the nursing program was significantly increased compared to the patients among the study group who were still risk-free. The rational may be due to difference between the age group of the current study and this study as 43.3% of study patient were less than 35 years old but in the current study the majority of subjects were between 50 and 60 years old. Because aging was a physiological process that might cause many changes in the body's systems, one of these changes occurred in the skin and its tissues, causing patients to experience impaired skin integrity.

The frequent positioning changes of immobilized patients with orthopedic disorders every 2 hours reduced pressure, friction, and shear damage, and they experienced less extended pressure on bony prominences. This maintained a sufficient flow of oxygen and nutrients to the area and prevented tissue death.

Concerning the pressure ulcer's stages, the present study found that there was a statistically significant difference between the study and control group in relation to stages of pressure injury at the 3rd and the 7th day post intervention. The current study showed that only six patients among the study group had stage II pressure ulcers comparing with the majority of the patients among the control group who developed pressure ulcer stage II after seven days of intervention. This may occur because of the care bundle's include intervention phases, which addressed all potential risk factors that could result the formation of pressure ulcers. It was also approved that adopting care bundle elements had an evidence-based practice to reducing pressure ulcers.

The current study's results were paralleled to what was stated by **Zhu et al., (2023)** who mentioned that after 5 days of follow up, the incidence of PU among the control group was found to be higher than among the observation group. **Mao and Zhu (2021)** provided confirmation for these findings, stating that a care bundle could lower the grade of pressure ulcers, which is advantageous for healing and rehabilitation. While according to the finding of **Tilmazer and Tuzer (2019)**, a care bundle was a collection of nursing treatments, each of which has been shown to enhance patient outcomes in clinical practice. Furthermore, care bundles enhanced patients' quality of life by introducing novel nursing concepts and created tailored nursing interventions for each patient with pressure ulcers. This also was in line with the finding of **Sugihara et al., (2018)** who reported that just two study subjects had stage I pressure ulcers.

In dissimilarity, a study done by **Zakaria et al. (2018)** found that approximately two thirds of the individuals had stage II pressure ulcers. In contrast to the control group, where the majority of patients had pressure ulcers in stages I, II, or III. These may be due to that the application of bundle of skin care in the current study gave best response. As the skin was the body's first line of defense, it was possible that the hospital routine care overlooked the significance of skin care to prevent pressure sores and infection.

The majority of the patients with orthopedic disorder among the control group did not properly care for their skin by cleaning, drying, and applying lubricant to bony prominences. This is especially concerning for patients with orthopedic disorders whose skin is delicate and prone to breakage.

According to the outcomes of the current study, after applying the nursing intervention, there was a statistically significant difference between the study and control groups, regarding the buttock which was the most often impacted region, while fewer affected the sacrum, greater trochanter, and heels. The study's findings were nearly similar to what was reported by **Gefen et al., 2020** who stated that nearly half of the pressure ulcer

reports were from the buttocks, whereas the heels, greater trochanter, and sacrum accounted for less than one fifth.

Regarding body areas of pressure injury, the current study revealed that buttocks were the most common affected area of pressure ulcer. The finding was in line with the finding of in a study done by **Mavris et al., (2022)** who reported the same findings. However, according to **Yang et al., (2017)** research, the key joints was the most frequently afflicted by pressure ulcers among patients with orthopedic disorders were the greater trochanter, heels, sacrum, ischium, and lateral malleoli. The difference between patient's characteristics and injury might be the reason for such different findings.

Conclusions

Nurse driven skin care bundle had a positive significant effect on preventing hospital acquired pressure injury among immobilized patients with orthopedic disorders.

Recommendations

- Immobilized patients with orthopedic disorders should be educated about the identification and reporting any changes in their skin condition.
- Collaborating should be done with other institutions to implement nurse driven skin care bundle as a preventive measure to reduce the incidence of hospital acquired pressure injury among immobilized patients with orthopedic disorders.

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