Pressure Ulcers Prevention through Applying Evidence–Based Nursing Intervention for Patients with Orthopedic Disorders

Wafaa Mustafa El Kotb [(1)], Amoura Soliman Behairy[(2)]

[1] Lecturer of Medical-Surgical Nursing, Faculty of Nursing, Menoufia University, Shebin El-Kom, Egypt.

[2] Assistant Professor of Medical-Surgical Nursing, Faculty of Nursing, Menoufia University, Shebin El-Kom, Egypt.

Corresponding author: Amoura Soliman Behairy, E. mail: amourabehairy@gmail.com

Abstract

Background: Pressure ulcers continue to be one of the most prevalent conditions in patients with orthopedic disorders, followed by immobilization. Aim: To evaluate the effect of pressure ulcer prevention through applying evidence-based nursing interventions for patients with orthopedic disorders. Setting: This study was implemented at the orthopedic department of Menoufia University Hospital, Egypt. Methods: A research design experiment was used in this study. A sample of 80 adult patients was randomly selected and split into two equal groups of 40 patients each. Three tools were utilized to collect data: tool (I): The Scio demographic and clinically structured interview questionnaire, including demographic data, personal hygiene, and a skin assessment observation check list (pressure ulcer signs and symptoms). (Tool 2): Predicting pressure sore risk using the Braden Scale (tool 3): The Numeric Pain Rating Scale. The results: The data analysis revealed that the intervention group had a statistically significant reduction in pain, redness, and edema of the skin in the study areas compared with the control group at the post-intervention period. As a result, the incidence of pressure ulcers among the study group was lower than in the control group. This means that the implementation of the evidence-based nursing interventions could prevent the occurrence of pressure ulcers in the intervention group. Conclusions: Implementation of an evidence-based nursing intervention could prevent the occurrence of pressure ulcers among the hospitalized patients in the orthopedic ward. Recommendations: Preventing pressure ulcers through evidence-based nursing interventions should be applied to an area of the skin in patients at risk for pressure ulcers.

Keywords: Evidence-Based, Nursing Intervention, Pressure Ulcer, Patient with Orthopedic Disorders

Introduction

Pressure ulcers (PUs) often recognized as pressure injuries **(Chaboyer et al., 2016).** A pressure injury is a localized soft tissue injury under the skin brought on by a medical device or other piece of equipment, typically over a bony prominence **(Hsieh, Lee, Wu, Zhuo, & Hwang, 2020)**. The injury could take the form of healthy skin or an open sore, and it could remain distressing. This harm is produced by strong and/or tenacious compression, or pressure combined with shearing. Additionally, to the soft tissue's state, microclimate, nutrition, perfusion, co-morbidities, patient tolerance to pressure and shear may all have an impact on the localized damage of the skin (Bader, Worsley, & Gefen, 2019)**.** In accordance with the European Pressure Ulcer Advisory Panel (EPUAP) and the National Pressure Ulcer Advisory Panel (NPUAP), PUs frequently develop on bony growths such as the sacrum, anterior growths of the upper iliac spine, heels, trochanter, occipital and shoulder region, while the nose, ears and lips are seldom affected **(NPUAP and EPUAP, 2016).**

The incidence of PUs on orthopedic wards is significant. According to Li, Lin, Thalib, and Chaboyer's study in 2020, patients in the orthopedic surgery ward had the greatest prevalence of pressure ulcers (18.5%). Immobility is followed by a greater prevalence of PUs than in any other specialty. As the rates of morbidity and mortality among patients without pressure ulcers are much lower than those among patients with orthopedic disorders who develop pressure ulcers. Evidence suggests that PUs could manifest after just a few hours of pressure caused by immobility. **(Perry et al., 2015).** While, **Rodrigues**, **Ferreira, & Ferré-Grau (2016)** added that there are numerous factors that could raise the threat of PU in the orthopedic sector, including age, physical limitations, as well as illnesses like diabetes, heart conditions and orthopedic disorders. Malnutrition, feces and urine incontinence, shifting positions every two hours, having family members as companions, using protective gear, fencing for the bed, medical mattresses, having traction and its type, as well as using mobility aids are other factors.

PU place a lot of strain on the patient, their families, and the system of health care. It greatly

affects a person's physical, psychological, and social well-being, causing pain, lengthening hospital stays, requiring more rehabilitation, and resulting in a number of problems, including depressive symptoms, discomfort, skin infections, osteomyelitis, sepsis, and even death. In the twentieth century, PU was acknowledged as one of the most physically and financially taxing complications, affecting people of all ages in both hospital and community settings. **(Borojeny, Albatineh, Dehkordi, & Gheshlagh 2020, Carrasco-Peralta, 2017)**

Nursing care places a high premium on prevention. One of the guiding concepts of nursing care is prevention. Also, among the most crucial health problems is PU. So, the prevention technique is to avoid the occurrence of PUs. Both sore prevention and therapy are required for pressure ulcer management (Karimi, et al., 2019). According to Tew et al., (2014) and Repi & Ivanovi (2014), there are several ways to prevent PUs, including: Analyzing the patient's likelihood of acquiring one; evaluating their skin and skin care; eating well; changing position; using a support surface to relieve pressure; and educating patients about the problem.

PU continues to be a major issue in hospitals and the community despite the abundance of information on prevention. The significance of decreasing the prevalence of PUs has been stressed by numerous researchers. Various researchers have used a number of prevention and treatment methods. Most of them highlighted the importance of reducing the incidence of pressure ulcers **(Moore & Webster, 2013).**

Hospital pressure ulcers, as a challenge, have received recent attention as preventable measures lead to a negative result. According to the national clinical recommendations, pressure ulcer preventive measures were produced, and there is proof to support the usefulness of several pressure ulcer precautionary methods. These include safeguarding skin from damage through lowering compression and rubbing, caring for skin and safeguarding bone prominences, keeping skin dry, changing position according to the schedule, and maintaining mobility **(Chaboyer et al., 2016).**

Numerous research about the prevention of pressure ulcers have been conducted, including those looking at the effectiveness of the sheepskin, coconut oil, olive oil, and hydro-colloid coating **(Hekmatpou, Mehrabi, Rahzani, & Aminiyan, 2018).** Also, Aloe Vera has therapeutic properties due to the existence of a substance called glucomannan. Glucomannan impedes fibroblast growth factor and encourages the activity and proliferation of the tissue. Aloe vera mucilage contains vitamin E, vitamin C, and some amino acids, which may contribute significantly to the enhanced healing of wounds (Citty, Cowan, Wingfield, & Stechmiller, 2019, Panahi, et al., 2015, Shahzad, and Ahmed, 2013). Hence the contemporary study aimed to examine the effect of evidence-based nursing intervention on the incidence of pressure ulcers among patients in orthopedic wards.

Significance of the study

PUs rank the third maximum costly disease after cancer and cardiovascular diseases, despite significant advancements in nursing and medicine **(Al-Hashemi, 2019)**. PUs are a significant physical and psychological issue for patients with orthopedic disorders that negatively affect their_daily activities. One of the most prevalent and challenging parts of having PUs is severe unrelenting pain **(Moore and Patton, 2019).**

However, nurses have long been interested in preventing pressure ulcers as preventing ulcers is one of the primary duties of nurses. It is still difficult for nurses to prevent pressure ulcers (PUs), and their prevalence is seen as a symptom of subpar treatment **(Blenman and Marks-Maran 2017).** So, during the early detection of the warning signs, nurses should maintain skin dryness, and emphasize on the significance of initial ambulation to rise circulation and alleviate pressure on bony prominences. Thus, nurses are crucial in protecting against PUs. The ability of nurses to prevent pressure ulcers has become increasingly important in care settings **(Biçer et al., 2019)**. The purpose of the present study is to determine the influence of evidence-based nursing interventions on the incidence of pressure ulcers among patients in orthopedic wards.

Aim of the study:

The current study aimed to examine the influence of evidence-based nursing interventions on the prevention of PUs among patients admitted to the orthopedic department.

Research Hypotheses

There were two research hypotheses for this study including:

1. Patients with orthopedic disorders who received evidence-based nursing intervention on the

prevention of pressure ulcers had a decrease in pain severity, redness, and edema compared to those who didn't not receive such intervention.

2. Patients with orthopedic disorders who received evidence-based nursing intervention had a lower incidence of pressure ulcers than those who didn't not receive such intervention.

Subjects and Methods

Design:

An experimental research design was used in the current study.

Setting:

The orthopedic department of Menoufia University Hospital in Egypt was the site of the current investigation.

Subjects:

80 adult patients who entered the orthopedic department at the previously mentioned location between January 2019 and September 2019 were selected randomly.

They were allocated into two equal groups of 40 patients in each group as follows:

Study group: They had received the evidence-based nursing intervention by the researchers.

Control group: They had received their routine care, which entails changing positions, cleaning their skin, and examining their skin. Additionally, a placebo was used; it was a water and starch gel in a glass container that was extremely similar to aloe vera gel.

Sample size:

When 10% of all patients with orthopedic problems encounter PUs, it was anticipated that the incidence of PUs would be three times higher among immobilized patients with high or very high scores of Braden scale, about 30% **(Babu , Madhavan , Singhal , & Sagar , 2015 & Kaur , Tewari , & Sekhon, 2015)**. The determined sample size for each group was 40 for an effect size of 30% between study and control with 80% power, 5% type I error, and a 10% dropout rate.

Inclusion criteria: it included patients aged from 18- 65 years old, both gender, bedridden, are at risk to develop bedsores from moderate to severe according to the scoring of Braden tool and a score of less than 13–14, also, had the possibility of hospital length of stay above 10 days, free of pressure ulcers on admission and the patient and/or attendant give informed consent to contribute in the study.

Exclusion criteria: It includes patients who have chronic illnesses like diabetes mellitus, tuberculosis, anemia, vascular diseases, heart disease, kidney disease, septicemia, skin conditions (such as psoriasis, fungal illnesses, freckles), mental diseases, and who had been previously received treatment with other topical medications or antibiotics.

Tools of the study:

After reviewing the recent, pertinent literature, they chose the following three tools to utilize to collect data:

Tool (I) The Scio demographic and clinically structured interview questionnaire:

The researcher developed and evaluated the interview questions before using it. The questionnaire is divided into the following three parts:

Part one: Demographic variables (age, sex, marital status, occupation, religion, area of residence, education, dietary habits, and type of injury).

Part two: Variables involving personal hygiene (Duration of confined to bed, measures taken to maintain personal hygiene, Turning Schedule followed, Type of material used for back care, Bed Linen Changing)

Part three: Skin assessment observation check list (pressure ulcer signs and symptoms): The daily record checklist criteria for PUs comprise pain, redness, edema, skin temperature (hotness) of pressure sites, the presence of a pressure ulcer, and its location. The Checklist was created utilizing the indices of the National Pressure Ulcer Advisory Panel for rating PU severity **(NPUAP, 2016)**. In the current study, the hip, heel, and sacral pressure ulcer study regions were assessed and recorded for 10 days.

Tool (II) The Braden Scale: Barbra Braden and Nancy Bergstrom created the Braden Scale for prediction pressure injury risk in 1987 to evaluate a patient's risk of suffering from a pressure injury by taking into account six different variables: sensory perception, skin moisture, activity, mobility, nutrition, friction, and shear.

A lower number indicates a higher chance of acquiring a pressure injury, and vice versa; the scale has a maximum value of 23 points. The Braden Scale comprises five risk categories: extremely high risk (scoring is 9 or less total), high risk (total score from10 - 12), moderate risk (total score from13 - 14), and mild risk (total score from 15 - 18) and no risk (Total score from 19-23). On the Braden scale, the correlation value for the total score was 0.80. Studies conducted on a national and worldwide scale verified the validity of this tool **(Hekmatpou, Mehrabi, Rahzani, and Aminiyan, 2018 & Chen et al., 2017).**

Tool (III) **The Numeric Pain Rating Scale**: The patients were asked to rate their present, best, and worst pain levels during the previous 24 hours. This method was created by **McCaffery and Beebe (1993).** The patient's 24-hour pain score was calculated using the average of the three ratings. "On a scale of 0 (no pain) to 10, the patient was asked to rate the intensity of his present, best, and worst pain levels for the previous 24 hours" (worst pain imaginable). The overall results as follows: 0 denotes no pain, 1-3 minor pain, 4-6 moderate pain, and 7–10 severe pain **(Tayyib & Coyer, 2016).**

Validity and Reliability:

A panel of seven professionals with expertise in medicine, surgery, nursing, and orthopedics evaluated all study tools for their content validity to determine and confirm their completeness, clarity and usefulness. The reliability test was created using Cronbach's alpha to evaluate internal consistency of the study tools. It has a Cronbach alpha of 0.82.

Administrative design:

The settings administrator gave his or her official authorization for the research to be done. The research's objective, nature, significance, and anticipated results were all addressed in detail.

Ethical consideration:

The Ethical Committee of the College of Nursing at Menoufia University examined and approved the study on evidence-based nursing interventions (approval No.722). After the researchers outlined the aim of the current research, the participants in the study or other pertinent parties gave their written consent. All study participants received guarantees of privacy and data confidentiality. At any point during the research procedure, the subjects had the right of leaving the study. The patients being examined could safely receive the evidence-based nursing intervention used in the current research.

A pilot study: Before the beginning of data collection, a pilot study was carried out on 10% of each group of participants to assess the tools' simplicity, viability, and usefulness, as well as how long it would take to complete. Because no alterations were made, participants from the pilot study were incorporated into the full study sample.

Data collection procedure:

- The tools development**:** The first study tool was created by the researchers after a revision and analysis of the relevant literature. The second and third study tools were taken from Braden and Nancy Bergstrom (1987) and McCaffery and Beebe (1993), respectively. Following an explanation of the study's purpose, official approval was obtained from the director of the hospital and the senior nurse of the orthopedic section.

- The development of the evidence-based nursing intervention was done after careful examination the related literature and identification the patients' needs. It included a strategy for changing positions, using pillows to protect bony prominences, properly making the bed two times daily (with close-fitting sheets to prevent folds), positioning the head of the bed at 30 degrees, avoiding skin dampness, getting enough fluids, controlling fecal and urine incontinence, utilizing absorbent pads, cleansing the skin in case of contamination, and applying aloe vera gel on bony prominences.
- The researcher began by introducing herself, the patients from both groups wishing to them a good day, then explain the advantages and goal of the study for all of them.
- The researcher conducted one-on-one interviews with each participant who decided to share in the research and met the criteria for participation in order to collect the baseline information about the sociodemographic traits, personal hygiene, indices of PUs, a scale for predicting the risk of developing PUs, and numeric pain rating scales at the orthopedic department of the university hospital. Each questionnaire was filled out in 20 to 30 minutes. These patients were admitted to treat fractures of the tip joint, femoral head, pelvis, and vertebrae.
- In the ward, patients who met the criteria for inclusion and had the possibility of developing pressure ulcers during their stay in the hospital

were observed, and all the needed information was gathered on a daily basis and documented in the data collection paper.

- Through using the random blocking methods, all patients who had the potential to develop bed sores were enrolled in the control and intervention groups. These blocks were divided into two groups after being sorted using a table of random numbers.
- Eighty patients were assessed for their potential vulnerability to develop pressure sores using data based on the scale of Braden risk factors. On the Scale of Braden, low-risk patients should score from15– to 18, moderate-risk patients should score from13–to14, and high-risk patients should score less than12 points. The lowest risk score is 6 points only, and the maximum score is 20 points.
- Aloe vera gel was applied on pressure areas of the skin for patients among the study group for 10 days along with the implementation of evidence-based nursing care to avoid the occurrence of PUs.
- Patients in the control group applied a placebo gel (water and starch) for 10 days on the skin of pressure points along with the routine hospital care. A placebo gel was somewhat like aloe vera gel. It was provided in a glass jar similar to Aloe vera gel glass container.
- A comparison was carried out between the results of the control and the intervention groups participants before and after implementing the nursing intervention to examine the effect of using evidence-based nursing interventions on the occurrence of PUs among patients admitted to orthopedic wards.

Implementation of nursing intervention:

The researcher applied the nursing intervention according to evidence-based practice for the prevention of pressure ulcers as follows among the study group:

- Changing patients position at least every 2 hours (consult with the physician for the right position).
- Placing a small pillow between legs or heels for removing and reducing pressure, avoiding skin-to-skin contact, and protecting bony prominences
- Put the bed's head at a 30 degree angle.
- Daily cleansing of the skin in case of contamination and control of urinary and fecal incontinence by nurses while providing patients in both groups with routine nursing care.
- Alternate the sheets when they become wet and change the bed two times daily, keeping taut bed sheets under the mattress to prevent folds.
- Provide and monitor patient daily fluid intake, whether ingested or administered intravenously as necessary.
- Nutrition (the meals given by the hospitals meet all of the dietary needs).
- Skin hygiene: Maintain clean, and dry skin, as PUs preventive methods include daily assessment of patient's skin at 9 am. Patient's skin assessment should include examining the pressure points such as the sacrum, trochanter, heel, occipital area, and shoulder.
- After washing and drying the leaves, the researcher extracted pure Aloe Vera gel; the central mucilage was then separated, much like fish fillets, and applied. The resulting mucilage had a high absorption rate and was translucent, non-sticky, and odorless. After testing a small amount of the pure Aloe-Vera gel on the inside of the forearm, the researcher applied the gel to the patient's skin twice daily (at nine in the morning and nine in the evening) on pressure points (the hip, sacrum, and heels), giving it two to three minutes to soak. On the patient's pressure sites, the gel rubbing procedure was used for ten days.
- For the control group, ward nurses performed the routine hospital care, such as changing positions, performing skin cleanliness, and examining the pressure points of patient's skin.
- Furthermore, the researcher applied the placebo which include of water and starch gel in a glass container that looked exactly like Aloe Vera gel twice daily (at 9 a.m. and 9 p.m.) on the same areas of the pressure points as in the intervention group, then the nurse dried the skin from the placebo using paper towels. The starch gel was eliminated immediately to stop the starch from absorbing or having its cooling effect on the skin. The starch was also applied for 10 days.

Evaluation of the nursing interventions: After the execution of the nursing care, every participant in the two groups was assessed three times at three-day

intervals to expect the development of PUs utilizing tools II and III as well as PUs indexes. On days 3, 7, and 10, the sacrum, hip (trochanter), and heel of the patients in both groups were assessed for the presence or absence of signs of pressure ulcers based on indices. The pressure ulcer indicators on areas of studied were completely assessed daily (twice daily, at 9 a.m. and 9 p.m.), by the researcher in order to feel the skin temperature and observe other indexes. Local inflammation and pressure ulcers stage 1 were defined if there arise in temperature (hotness) with insistent redness, localized swelling, enduring edema by finger, with pain in the sacrum, hip, and heel among both groups.

Statistical Analysis

On an IBM compatible computer, the collected data were tabulated and analyzed using SPSS (statistical package for the social science software), version 20.

There were two distinct statistical analyses:

1) **Descriptive statistics:** were expressed as mean and standard deviation (X+SD) for quantitative data or number and percentage (No & %) for qualitative data.
2) **Analytic statistics:**
   - **1-** Pearson Chi-square test (χ^2) & Fisher`s Exact Test: It is the test of significance used to the study association between two qualitative variables.
   - **2-** Student the t-test: a test of significance used for comparison between two independent groups of normally distributed quantitative variables.

A P-value of 0.05 was used to determine significance regarding:

- P-value > 0.05 to be statistically insignificant.
- P-value ≤ 0.05 to be statistically significant.
- P-value ≤ 0.001 to be highly statistically significant.

Results:

Table (1): Revealed that the mean age for the study group was (38.12 ± 10.15 years) while for the control group (37.92± 10.14 years) respectively. Female patients in the study group was more than half (52%) while (57.5 %) of the control group was male. The majority of the study and the control groups were married (57.5% and 75%) respectively. and (62.5 % and 55%) respectively lived in rural areas, while (50%, 42.5%) respectively had secondary education. Both studied groups were equal regarding the dietary patterns (40%). One-third of the study group (30 %) was treated for pelvic fractures and one-third of the control group (32.5 %) had femoral head fractures. There were no significant differences between the study and the control groups almost in all sociodemographic characteristics.

Table (2): Showed statistically significant differences between the study and control groups regarding the shift schedule for changing patient position at the post-intervention period with P values =< 0.001.

Table (3): revealed repeated measurements of pressure ulcer signs and symptoms before and after intervention in the study and control groups. The level of pain, redness, and edema on the hip showed that there was no significant difference between the study and control groups before the intervention and at the third- and seventh-days post-intervention. While there was significant difference on the tenth day after the intervention. On the sacrum and heel areas, there was no significant difference between the study and control groups before the intervention and at the third, seventh-, and tenth-days post-intervention. In terms of temperature measurement on the hip and sacrum areas, there was no statistically significant difference between the two groups before intervention and on the third day after intervention, but there was statistically significant difference on the seventh and tenth days after intervention.

Figure (1): Illustrated an improvement regarding pain level post nursing intervention among the study group rather than among patients in the control group who were suffering from severe pain (45%).

Table (4): Illustrated that there were no statistically significant differences between the study and control groups regarding the Braden scale for predicting pressure sore risk at pre-intervention period.

Figure (2): Showed that there isn't any occurrence of pressure ulcers in both groups during pre-nursing intervention while post-in intervention incidence of pressure ulcers in the study group was less than among patients in the control group (7.5 % and 32.5%) respectively.

Figure (3): revealed that the most and the least occurrence site of PU after intervention was in the sacrum and heel between the control and study groups (20, 5 and 2.5, 0) respectively.

Table (1): Distribution of bio-demographic characteristics of the study participants

Demographic characteristics	Studied groups				Test of significance	P value
	Intervention (study) group (n=40)		Control group (n=40)			
	NO.	%	NO.	%		
Age (years):						
Mean±SD	38.12 ± 10.15		37.92± 10.14		**t-test**	0.93
Range	22.0 – 61.0		19.0– 60.0		= 0.08	NS
Gender:						
Male	19	47.5	23	57.5	χ^2	0.37
Female	21	52.5	17	42.5	= 0.80	NS
Marital status:						
Single	13	32.5	5	12.5	χ^2	0.14
Married	23	57.5	30	75.0	=5.48	NS
Widowed	2	5.0	4	10.0		
Divorced	2	5.0	1	2.5		
Occupation:						
Manual labor workers	3	7.5	3	7.5	χ^2	0.24
Commerce work	6	15.0	8	20.0	=5.49	NS
Office administrative worker	8	20.0	15	37.5		
Housewife	11	27.5	9	22.5		
Not working	12	30.0	5	12.5		
Education level:						
Illiterate	1	2.5	1	2.5		
Read and write.	6	15.0	5	12.5	χ^2	0.87
Primary	7	17.5	11	27.5	= 1.22	NS
Secondary	20	50.0	17	42.5		
University	6	15.0	6	15.0		
Residence:						
Rural	25	62.5	22	55.0	χ^2	0.49
Urban	15	37.5	18	45.0	=0.46	NS
Dietary pattern						
fat diet	16	40.0	17	42.5	χ^2	0.95
High CHO diet	16	40.0	16	40.0	=0.09	NS
High protein diet	8	20.0	7	17.5		
Type of orthopedic injury:						
Hip fracture	7	17.5	10	25.0		
Femoral head fracture	3	7.5	13	32.5	χ^2	0.02
Pelvic fracture	12	30.0	9	22.5	=11.05	S
Vertebral fractures	11	27.5	5	12.5		
Multiple trauma (several fractures)	7	17.5	3	7.5		

Table (2): Distribution of the studied groups regarding personal hygiene characteristics:

Personal hygiene	Studied groups				Test of significance	P value
	Intervention (study) group (n=40)		Control group (n=40)			
	NO.	%	NO.	%		
Duration of bedridden:						
Less than a month	7	17.5	17	42.5	χ^2	<0.001
2-5 months	9	22.5	18	45.0	=19.87	HS
6-12 months	22	55.0	5	12.5		
For more than a year	2	5.0	0	0.0		
Measures are taken to maintain personal hygiene:						
Sponging	24	60.0	23	57.5		
Nail and hair care	13	32.5	13	32.5	χ^2	0.64
Grooming	2	5.0	4	10.0	=1.68	NS
Back care	1	2.5	0	0.0		
Follow the shift schedule for changing patient position (Pre-intervention):						
Every 2 hours	0	0.0	3	7.5	χ^2	0.33
Every 4 hours	12	30.0	11	27.5	=3.37	NS
Every 6 hours	21	52.5	21	52.5		
None	7	17.5	5	12.5		
Follow the shift schedule for changing patient position (Post-intervention):						
Every 2 hours	40	100.0	0	0.0	χ^2	<0.001
Every 4 hours	0	0.0	21	52.5	=80.0	HS
Every 6 hours	0	0.0	14	35.0		
None	0		5	12.5		
Type of material used for back care (Pre-intervention):						
Soap and water	6	15.0	4	10.0	χ^2	0.48
Plain water	21	52.5	18	45	=1.43	NS
Talcum powder	13	32.5	18	45		
Frequency of changing bed linens:						
Daily	11	27.5	5	12.5	χ^2	0.19
Once a week	25	62.5	32	80.0	=3.25	NS
Twice a week	4	10.0	3	7.5		

Table (3): Distribution of pressure ulcer sign and symptom scores among both studied groups at three different intervals.

Pressure ulcer signs and symptom	Studied groups				Test of sig.	P value
	Intervention group (n=40)		Control group (n=40)			
	NO.	%	NO.	%		
Hip (trochanter) redness, edema, and pain (before intervention):						
Absent	40	100.0	40	100.0	NA	NA
Hip (trochanter) redness, edema, and pain (after 3 days):						
Absent	34	85.0	33	82.5	$\chi 2$	0.76
Present	6	15.0	7	17.5	=0.09	NS
Hip (trochanter) redness, edema, and pain (after 7 days):						
Absent	37	92.5	31	77.5	$\chi 2$	0.06
Present	3	7.5	9	22.5	=3.52	NS
Hip (trochanter) redness, edema, and pain (after 10 days):						
Absent	39	97.5	27	67.5	$\chi 2$	<0.001
Present	1	2.5	13	32.5	=12.46	HS
Sacrum redness, edema, and pain (before intervention):						
Absent	40	100.0	40	100.0	NA	NA
Sacrum redness, edema, and pain (after 3 days):						
Absent	38	95.0	35	87.5	$\chi 2$	0.43*
Present	2	5.0	5	12.5	=1.40	NS
Sacrum redness, edema, and pain (after 7 days):						
Absent	38	95.0	35	87.5	$\chi 2$	0.43*
Present	2	5.0	5	12.5	=1.40	NS
Sacrum redness, edema, and pain (after 10 days):						
Absent	38	95.0	35	87.5	$\chi 2$	0.43*
Present	2	5.0	5	12.5	=1.40	NS
Heel redness, edema, and pain (before intervention):						
Absent	40	100.0	40	100.0	NA	NA
Heel redness, edema, and pain (after 3 days):						
Absent	40	100.0	40	100.0	NA	NA
Heel redness, edema, and pain (after 7 days):						
Absent	39	97.5	35	87.5	$\chi 2$	0.20*
Present	1	2.5	5	12.5	=2.88	NS
Heel redness, edema, and pain (after 10 days):						
Absent	39	97.5	36	90.0	$\chi 2$	0.35*
Present	1	2.5	4	10.0	=1.92	NS
Hip (trochanter) temperature (before intervention):						
36.8 – 37.1	40	100.0	40	100.0	NA	NA
Hip (trochanter) temperature (after 3 days):						
36.8 – 37.1	40	100.0	40	100.0	NA	NA
Hip (trochanter) temperature (after 7 days):						
36.8 – 37.1	39	97.5	31	77.5	$\chi 2$	0.007
37.2 – 37.4	1	2.5	9	22.5	=7.31	S
Hip (trochanter) temperature (after 10 days):						
36.8 – 37.1	39	97.5	31	77.5	$\chi 2$	0.004

37.2 – 37.4 37.5 – 37.9	1 0	2.5 0.0	0 9	0.0 22.5	=10.91	S
Sacrum temperature (before intervention): 36.8 – 37.1	40	100.0	40	100.0	NA	NA
Sacrum temperature (after 3 days): 36.8 – 37.1 37.2 – 37.4 37.5 – 37.9	38 0 2	95.0 0.0 5.0	35 5 0	87.5 12.5 0.0	**χ2** =7.12	0.02 S
Sacrum temperature (after 7 days): 36.8 – 37.1 37.2 – 37.4	38 2	95.0 5.0	35 5	87.5 12.5	**χ2** =1.40	0.43* NS
Sacrum temperature (after 10 days): 36.8 – 37.1 37.2 – 37.4 37.5 – 37.9	38 2 0	95.0 5.0 0.0	35 0 5	87.5 0.0 12.5	**χ2** =7.12	0.02 S
Heel temperature (before intervention): 36.8 – 37.1	40	100.0	40	100.0	NA	NA
Heel temperature (after 3 days): 36.8 – 37.1	40	100.0	40	100.0	NA	NA
Heel temperature (after 7 days): 36.8 – 37.1 37.2 – 37.4	39 1	97.5 2.5	36 4	90.0 10.0	**χ2** =1.92	0.35* NS
Heel temperature (after 10 days): 36.8 – 37.1 37.2 – 37.4 37.5 – 37.9	39 1 0	97.5 2.5 0.0	36 0 4	90.0 0.0 10.0	**χ2** =5.12	0.07 NS

* Fisher`s Exact Test

Figure (1): The Numeric Pain Rating Scale of the studied group post-implementation of nursing intervention:

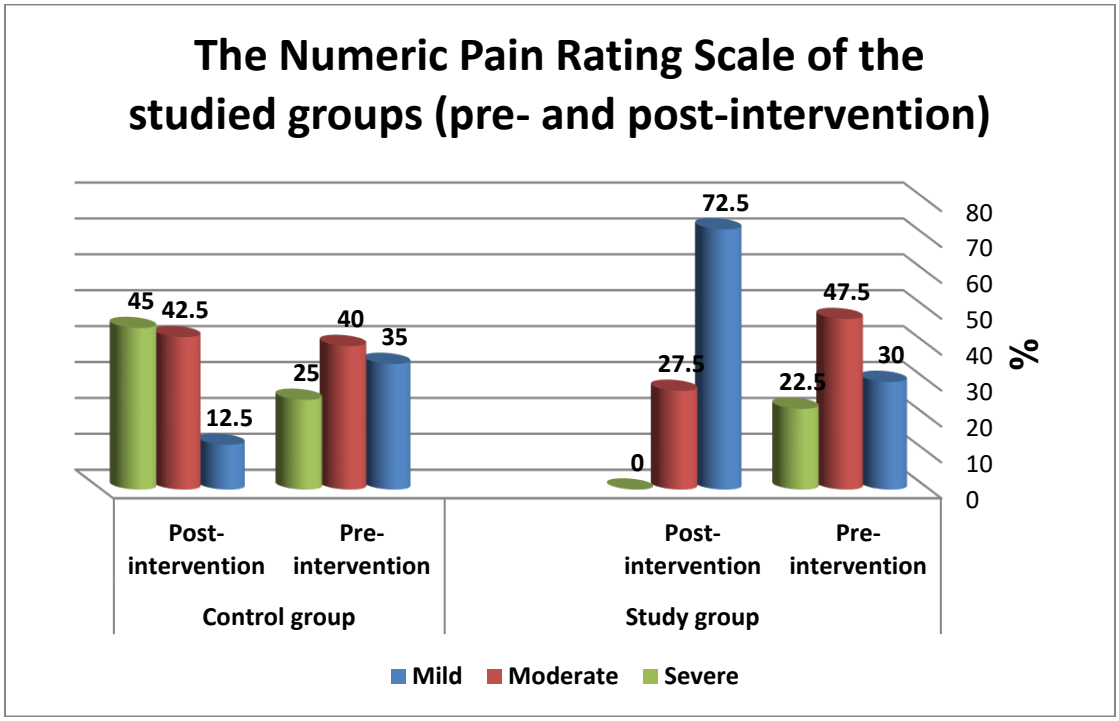


Table (4): Distribution of total Braden Scale scores of the study participants' pre -implementation of nursing intervention.

Braden Scale	Studied groups				Test of significance	P value
	Intervention group (n=40)		Control group (n=40)			
	NO	%	NO	%		
The total score on Braden Scale:						
• High risk 10-12	21	52.5	24	60.0	$\chi 2$	0.11
• Moderate risk 13-14	19	47.5	16	32.5	=4.32	NS
• Mild risk 15-18	0	0.0	3	7.5		

Figure (2): Distribution of the study participants' pre and post-implementation of nursing intervention regarding the occurrence of pressure ulcers:

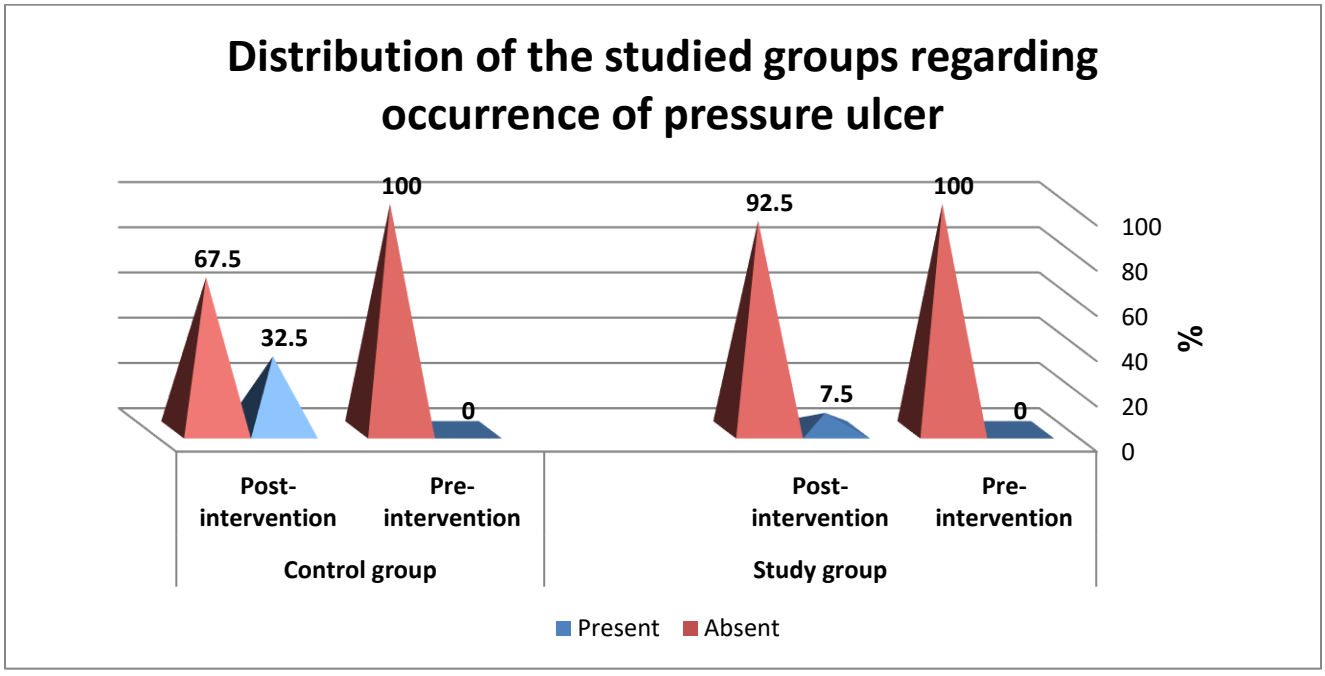
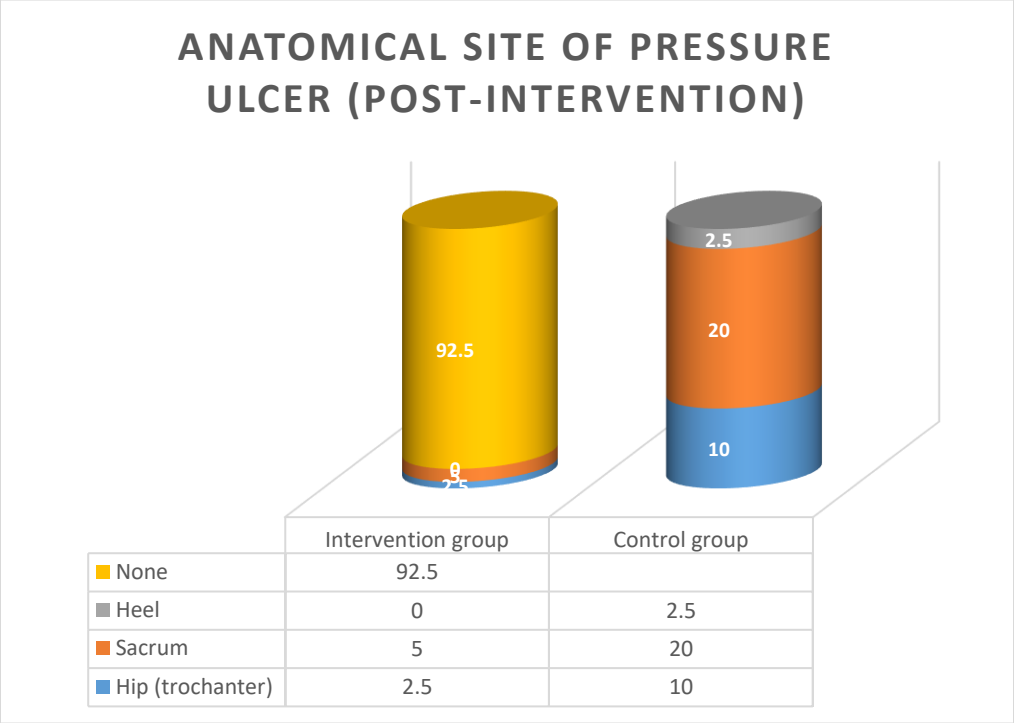


Figure (3): Distribution of the study participants post implementation of nursing intervention regarding the site of pressure ulcer:



Discussion

In most cases, using the right preventative techniques for pressure ulcers could be positive. Prevention of PU is crucial and reflects the skill of the health care providers. The burden on people and the economy could be lessened by implementing evidence-based recommendations. The relevant-evidence recommendations and statements of competent level of practice made by the health professionals develop the international practice guidelines for avoidance and control of PU **(Kirkkand-Khyn, Teleten, Joseph, & Maguina, 2019).**

The following findings from the current study will be reviewed and covered:

Regarding bio-demographic features of the current study participants, the average age of the patients in the control group was 37.92 years old and in the study group was 38.12 years old, with the majority of them being married. The two study groups were assumed to be homogeneous before intervention as the baseline assessment should no statistically significantly differences between the study and control groups concerning the demographic features that could have affected the results. This result showed that the patient characteristics of both groups were equivalent to those in a previous study done by **Hekmatpou et al. (2018)** who studied pressure ulcer prevention among patients with orthopedic disorders.

Concerning changing patient position as a preventive measure in evidence-based nursing intervention, the existing study found that there was no significant difference between control and study groups before intervention. This finding indicated that the two studied groups were homogenous prior the intervention. There was significant difference between the study and control groups after intervention when patients in the study group were shifted every two hours, whereas those in the control group were moved every four to six hours. This conclusion is consistent with the protocol of care recommended by **Nixon et al., (2019)** who stated that turning patients every 2 hours without a pressure-reducing mattress and every 4 hours with a pressure-reducing mattress is necessary to lower the incidence of pressure ulcers. In contrast to the earlier finding done by, **Manzano et al., (2014).** As they came to conclusion that frequent repositioning on a pressure-relieving mattress does not always result in fewer pressure ulcer lesions and, as a result, cannot

be consider an effective preventive intervention. This may be elucidated by the fact that in the present study, mattresses without pressure-relieving features were the most broadly available and economically viable option.

The current study also found that significant differences existed regarding the length of bed ridden between the study and control groups. As a result, immobility increase the occurrence of PUs among patients, as the results of several recent studies shown this conclusion **(Skogestad et al., 2017).** This finding could be clarified by the fact that it is more beneficial to recognize people who are at danger for developing PUs before they do so to employ effective preventative strategies for them.

Regarding the assessment of the skin on the sacrum, hip, and heel in both groups on days 3, 7, and 10 to determine if PUs were present or not based on the indices. The present study finding shown that there was a significant difference on the tenth day after the intervention regarding the hip area's level of pain, redness, and edema between the study and control groups. The presence of PU prior symptoms on the hip region among the control group was more than the study group which confirms that PUs, according to **Kottner et al., (2015).** Also, according to the findings of numerous studies done by **Panahi, et al., (2015) and Hekmatpou, et al., (2018)** are consistent with the current study finding. The preceding research supported the anti-inflammatory, antibacterial, antiviral, and antiseptic properties of aloe vera. Additionally, as noted in several studies, aloe vera was the safeguards of the skin, heals and prevents wounds as well **(Sahu, et al., 2013)**. This study's finding could also be explained by the fact that applying evidence-based interventions as a package is more effective in preventing PUs among patients with orthopedic disorders. Who may have underlying local inflammatory disorders.

In the current study, on the seventh and tenth days following care, there was a significant difference regarding the hip and sacral temperatures, which were used as predictors for the identification of PUs. This research's findings are similar to the results of **Hekmatpou et al., (2018)** who discovered that among patients with orthopedic disorders, the control group's hip and sacral temperatures increased more than those patients among the study group. According to **Kottner et al. (2015)**, the most significant indicator of PUs was the changes in local skin temperature, which is one of the most logical explanations for the prior findings. In addition, individuals in the current study who sustained orthopedic injuries experienced an increase in body temperature because of both systemic and local inflammation of the skin under pressure.

In terms of pain as another indicator of PUs, the current study found that, whereas the control group felt severe pain in the areas under examination following intervention, the study group had a moderate to mild level of pain. Like the prior findings, **Briggs et al. (2013),** reported that people at risk of developing PUs had pain. According to **Briggs et al. (2013),** this could be illuminated by the fact that damage to the nerves and local inflammation in PUs were the main causes of pain. However, **Jocelyn Chew, Thiara, Lopez, & Shorey, (2017)** mentioned that the severity of pain is influenced by things like age, underlying illnesses, scars, and pressure. In the current study, the reduction of pain among the study group following the implementation of the intervention could be explained by the analgesic and anti-inflammatory effects of Aloe Vera.

In the current study, the Braden scale was utilized as a risk assessment tool to determine which patients would be most likely to develop pressure ulcer if no measures were taken to prevent it. Between the study group and the control group, there was no significant difference before intervention. As homogeneity between the study and control groups before intervention was approved in the previous conclusion. The previous finding is line with the results of a study done by **Skogestad, et al., (2017)** who utilized Braden scale before intervention as evidence-based risk assessment.

The results of the present study indicated a significant difference between the study and control groups regarding the incidence of pressure ulcers following intervention. This finding is in line with several studies done by **Hekmatpou et al., (2018),** that looked at the effectiveness of aloe vera gel in comparing to gels made by starch and water in order to avoid PUs. Additionally, **Baghdadi, Rafiei, Rashvand, & Oveisi, (2019)**, demonstrated the efficacy of aloe vera gel in lowering the prevalence of PUs. Furthermore, study done by **Karimi, et al., (2019),** reported the positive effect of aloe vera in the avoidance of PUs.

Regarding site of occurrence of PUs post-intervention, based on the findings of the current study, the most common locations of PU existence were the sacrum, hip, and heel, respectively, between the two groups. This finding is consistent with a research done by **Hekmatpou et al. (2018),** who discovered that the most common and least common spot of occurrence of pressure ulcers post-intervention was the sacrum and heel, respectively, among patients with orthopedic

disorders. However, other studies done by **Afkar et al. (2014)** reported that the most common areas included first were the sacrum, then the heel, and lastly the hip. According to **Kalowes, Messina, and Li (2016)**, most of the PUs occurred in the sacral areas, which is consistent with previous research findings. Furthermore, **Hallaj (2017)** reported that the most frequently affected areas were the heels, greater trochanter, sacrum, the ischium, and the lateral malleoli among the hospitalized geriatric patients.

Conclusion: The current study revealed that, among hospitalized patients in the orthopedic ward, the application of an evidence-based nursing intervention is relatively high compared to those that are not applying evidence-based and results in a decrease in pain, redness, and edema in the study areas of the skin during the post-intervention period. Additionally, pressure ulcers are preventable. Finally, the two research hypotheses that were predicted are supported by the study's findings.

Recommendations:
Applying evidence-based nursing interventions to patient areas of skin that are susceptible to pressure sores could be advantageous to undertake comparable studies on additional samples. Furthermore, nurses should get ongoing education regarding the measures needed to avoid developing pressure ulcers, with a focus on how essential it is that they be used in the course of their everyday duties.

Conflicts of interest disclosure: The authors confirm that they have no conflicting interests.
Financial support: There was no money received to carry on the current study.

References

Afkar A, Mahboubi M, Mehrabian F, Farmanbar R, Ghahramani F,Kazemnejad A, et al.(2014). Predictive factors of ICU bedsores using Braden scale. J Kermanshah Univ Med Science, 18(4):220–5.

Al-Hashemi, H. (2019). Incidence, Prevalence, And Complications of Pressure Ulcers In General Medical and Surgical Units Using A Multidisciplinary Model (Prospective Cohort). Biomedical Journal of Scientific & Technical Research, 18(1).
https://doi.org/10.26717/bjstr.2019.18.003109

Baghdadi, M., Rafiei, H., Rashvand, F., & Oveisi, S. (2019). Effect of Aloe vera
Gel, Calendula officinal is Ointment and Simple Prophylactic Sacral Dressings for Pressure Injury Development</p>. Chronic Wound Care Management and Research, Volume 7, 19–26. https://doi.org/10.2147/cwcmr.s256537

Bader, D., Worsley, P., & Gefen, A. (2019). Bioengineering considerations in the prevention of medical device-related pressure ulcers. Clinical Biomechanics, 67, 70–77. https://doi.org/10.1016/j.clinbiomech.2019.04.018.

Babu, A., Madhavan, K., Singhal, M., Sagar, S., & Ranjan, P. (2015). Pressure Ulcer Surveillance in Neurotrauma Patients at a Level One Trauma Centre in India. Oman medical journal, 30(6), 441–446. https://doi.org/10.5001/omj.2015.877.

Blenman, J., & Marks-Maran, D. (2017). Pressure ulcer prevention is everyone's business: the PUPS project. British journal of nursing (Mark Allen Publishing), 26(6), S16–S26.
https://doi.org/10.12968/bjon.2017.26.6.S16

Bicer, E. K., Güclüel, Y., Türker, M., Kepicoglu, N. A., Gümüs Sekerci, Y., & Say, A. (2019). Pressure Ulcer Prevalence, Incidence, Risk, Clinical Features, and Outcomes among Patients in a Turkish Hospital: A Cross-sectional, Retrospective Study. Wound Management& Prevention, 65(1), 20–28. https://doi.org/10.25270/wmp.2019.2.2028

Borojeny, L., Albatineh, A., Dehkordi, A., & Gheshlagh, R. (2020). The Incidence of Pressure Ulcers and its Associations in Different Wards of the Hospital: A Systematic Review and Meta-Analysis. International journal of preventive medicine, 11, 171.
https://doi.org/10.4103/ijpvm.IJPVM_182_19

Briggs, M., Collinson, M., Wilson, L., Rivers, C., McGinnis, E., Dealey, C., Brown, J., Coleman, S., Stubbs, N., Stevenson, R., Nelson, E. A., & Nixon, J. (2013). The prevalence of pain at pressure areas and pressure ulcers in hospitalized patients. *BMC nursing*, *12*(1), 19.
https://doi.org/10.1186/1472-6955-12-19

Carrasco-Peralta, J. A. (2017). Risk factors associated with the onset of pressure ulcers in heart surgery patients. Enfermería Clínica (English Edition), 27(4), 265–266.
https://doi.org/10.1016/j.enfcle.2017.03.005

Chaboyer, W., Bucknall, T., Webster, J., McInnes, E., Gillespie, B. M., Banks, M., Wallis, M. (2016). The effect of a patient centred care bundle intervention on pressure ulcer incidence (INTACT): A cluster

randomised trial. International Journal of Nursing Studies, 64, 63–71. https://doi.org/10.1016/j.ijnurstu.2016.09.015

Chen, H. L., Cao, Y. J., Zhang, W., Wang, J., & Huai, B. S. (2017). Braden scale (ALB) for assessing pressure ulcer risk in hospital patients: A validity and reliability study. *Applied nursing research: ANR*, *33*, 169–174. https://doi.org/10.1016/j.apnr.2016.12.001

Citty, S. W., Cowan, L. J., Wingfield, Z., & Stechmiller, J. (2019). Optimizing Nutrition Care for Pressure Injuries in Hospitalized Patients. Advances in Wound Care, 8(7), 309–322. https://doi.org/10.1089/wound.2018.0925

Hallaj, F. (2017). Effect of Applying Nursing Interventions for Preventing Pressure Ulcers among Hospitalized Geriatric Patients. Alexandria Scientific Nursing Journal, 19(2), 57–68. https://doi.org/10.21608/asalexu.2017.208351

Hekmatpou, D., Mehrabi, F., Rahzani, K., & Aminiyan, A. (2018). The effect of Aloe Vera gel on prevention of pressure ulcers in patients hospitalized in the orthopedic wards: a randomized triple-blind clinical trial. BMC complementary and alternative medicine, 18(1), 264. https://doi.org/10.1186/s12906-018-2326-2

Hsieh, H. S., Lee, C. Y., Wu, H. P., Zhuo, M. Y., & Hwang, C. F. (2020). Pressure Ulcers and skin Infections after Cochlear Implantation: A Delayed yet Serious Issue. International Journal of Pediatric Otorhinolaryngology, 110241

Jocelyn Chew, H. S., Thiara, E., Lopez, V., & Shorey, S. (2017). Turning frequency in adult bedridden patients to prevent hospital-acquired pressure ulcer: A scoping review. International Wound Journal, 15(2), 225–236. https://doi.org/10.1111/iwj.12855

Kalowes, P., Messina, V., & Li, M. (2016). Five-Layered Soft Silicone Foam Dressing to Prevent Pressure Ulcers in the Intensive Care Unit. American Journal of Critical Care, 25(6), e108–e119. https://doi.org/10.4037/ajcc2016875

Kirkkand-Khyn, H., Teleten, O., Joseph, R., & Maguina, P. (2019). A Descriptive Study of Hospital- and Community-acquired Pressure Ulcers/Injuries. Wound Management & Prevention, 65(1), 14–19. https://doi.org/10.25270/wmp.2019.2.1419

Kottner, J., Dobos, G., Andruck, A., Trojahn, C., Apelt, J., Wehrmeyer, H., Richter, C., & Blume-Peytavi, U. (2015). Skin response to sustained loading: A clinical explorative study. *Journal of tissue viability*, *24*(3), 114–122. https://doi.org/10.1016/j.jtv.2015.04.002

Kaur, S., Tewari, M. K., & Sekhon, P. K. (2015). Incidence of Bedsore among the admitted Patients in a Tertiary Care Hospital. Journal of Postgraduate Medicine, Education and Research, 49(1), 26–31. https://doi.org/10.5005/jp-journals-10028-1138

Karimi, Z., Behnammoghadam, M., Rafiei, H., Abdi, N., Zoladl, M., Talebianpoor, M. S., Khastavaneh, M. (2019). Impact of olive oil and honey on healing of diabetic foot: a randomized controlled trial. Clinical, Cosmetic and Investigational Dermatology, Volume 12, 347–354. https://doi.org/10.2147/ccid.s198577

Li, Z., Lin, F., Thalib, L., & Chaboyer, W. (2020). Global prevalence and incidence of pressure injuries in hospitalized adult patients: A systematic review and meta-analysis. International Journal of Nursing Studies, 105, 103546. https://doi.org/10.1016/j.ijnurstu.2020.103546

Mahmoodpoor, A., Shadvar, K., Saghaleini, S., Dehghan, K., & Ostadi, Z. (2018). Pressure ulcer and nutrition. Indian Journal of Critical Care Medicine, 22(4), 283–289. https://doi.org/10.4103/ijccm.ijccm_277_17

Manzano, F., Colmenero, M., Pérez-Pérez, A. M., Roldán, D., Jiménez-Quintana, M. D. M., Mañas, M. R., Fernández-Mondéjar, E. (2014). Comparison of two repositioning schedules for the prevention of pressure ulcers in patients on mechanical ventilation with alternating pressure air mattresses. Intensive Care Medicine, 40(11), 1679–1687. https://doi.org/10.1007/s00134-014-3424-3

Moore, Z. E., & Patton, D. (2019). Risk assessment tools for the prevention of pressure ulcers. Cochrane Database of Systematic Reviews, 2019(1). https://doi.org/10.1002/14651858.cd006471.pub4

Moore, Z. E., & Webster, J. (2013). Dressings and topical agents for preventing pressure ulcers. Cochrane Database of Systematic Reviews https://doi.org/10.1002/14651858.cd009362.pub2

National Pressure Ulcer Advisory Panel Responds to Editorial. (2016). Advances in Skin & Wound Care,

29(12), 535–535. https://doi.org/10.1097/01.asw.0000508227.61503.f9

Nixon, J., Brown, S., Smith, I. L., McGinnis, E., Vargas-Palacios, A., Nelson, E. A., Hulme, C. (2019). Comparing alternating pressure mattresses and high-specification foam mattresses to prevent pressure ulcers in high-risk patients: the PRESSURE 2 RCT. Health Technology Assessment, 23(52), 1–176. https://doi.org/10.3310/hta23520

Panahi, Y., Izadi, M., Sayyadi, N., Rezaee, R., Jonaidi-Jafari, N., Beiraghdar, F., Sahebkar, A. (2015). Comparative trial of Aloe vera/olive oil combination cream versus phenytoin cream in the treatment of chronic wounds. Journal of Wound Care, 24(10), 459–465.
https://doi.org/10.12968/jowc.2015.24.10.459

Perry D, Borchert K, Burke S, Chick K, Johnson K, Kraft W, Patel B, Thompson S. (2015). Pressure Ulcer Prevention and Treatment Protocol. Institute for Clinical Systems Improvement. Available at: http://www.icsi.org.

Repić, G., & Ivanović, S. (2014). Pressure ulcers and their impact on quality of life. Acta Medica Medianae. 53(4): 75–80. https://doi.org/10.5633/amm.2014.0412

Rodrigues, A. M., Ferreira, P. L., & Ferré-Grau, C. (2016). Providing informal home care for pressure ulcer patients: how it affects carers' quality of life and burden. Journal of Clinical Nursing, 25(19-20), 3026-3035.

Sahu PK, Dayal Giri D, Singh R, et al. (2013). Therapeutic and medicinal uses of Aloe era: a review. Pharmacol Pharm.; 4:599–610.

Shahzad, M. N., & Ahmed, N. (2013). Effectiveness of Aloe Vera gel compared with 1% silver sulphadiazine cream as burn wound dressing in second degree burns. JPMA. The Journal of the Pakistan Medical Association, 63(2), 225–230.

Skogestad, I. J., Martinsen, L., Børsting, T. E., Granheim, T. I., Ludvigsen, E. S., Gay, C. L., & Lerdal, A. (2017). Supplementing the Braden scale for pressure ulcer risk among medical inpatients: the contribution of self-reported symptoms and standard laboratory tests. Journal of clinical nursing, 26(1-2), 202–214. https://doi.org/10.1111/jocn.13438

Tayyib, N., & Coyer, F. (2016). Effectiveness of Pressure Ulcer Prevention Strategies for Adult Patients in Intensive Care Units: A Systematic Review. Worldviews on Evidence-Based Nursing, 13(6), 432–444. https://doi.org/10.1111/wvn.12177

Tew, C., Hettrick, H., Holden-Mount, S., Grigsby, R., Rhodovi, J., Moore, L., Siddiqui, A. (2014). Recurring pressure ulcers: Identifying the definitions. A National Pressure Ulcer Advisory Panel white paper. Wound Repair and Regeneration, 22(3), 301–304.
https://doi.org/10.1111/wrr.12183