

## Effect of Implementing Evidence-Based Care Bundle on Prevention of Pressure Injury in Dependent Burned Patients

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### Abstract

**Background:** Pressure injury results in significant physical, social and physiological problems for patients. It is important to implement strategies that prevent pressure injury development in burn patients. A care bundle is a structured group of interventions based on clinical practice guidelines that improve processes of care, encourage compliance to guidelines, and have been shown to improve patient outcomes.

**Aim:** To evaluate the effect of implementing evidence-based care bundle on prevention of pressure injury in dependent burned patients.

**Methods:** Quasi-experimental research design was utilized. A purposive sample of 50 burned patients were assigned into 2 equal groups; a control group received routine nursing care and a study group experienced the evidence-based pressure ulcer care bundle.

**Results:** All items of comprehensive skin assessment namely; temperature, color, moisture, turgor, integrity and tissue perfusion were significantly improved post implementation of evidence-based pressure ulcer care bundle in the study group. A significant difference was found between the study and control group regarding Braden risk assessment in the fourth and seventh days of follow up.

**Conclusion:** It can be concluded that implementing the evidence-based pressure ulcer care bundle significantly reduced the development of pressure ulcer in burned patients.

**Keywords:** Care bundle, Pressure injury, Burn, Evidence based skin care bundle, Braden scale.

### Introduction

Pressure Injury represents a complex clinical problem with multi-factorial etiologies<sup>(1)</sup>. They are also known as decubitus ulcers, bed sores or pressure sores. In April 2016, the National Pressure Ulcer Advisory Panel replaced the term pressure ulcer with pressure injury<sup>(2)</sup>. Pressure injuries were important health problem and one of the most challenging issue that organizations face on a frequently basis. Away from the huge cost of management, pressure injuries have an important impact on the life of the patients and on the health care provider's ability to deliver appropriate care to patients<sup>(3)</sup>. It was found that pressure injuries increase patient morbidity, prolong hospital stay, and increase hospital costs<sup>(4)</sup>. Although all bed ridden patients are at risk for developing pressure injuries, it is important to note that burn patients suffer from unique, specific risk factors such as poor nutritional status, decreased tissue perfusion, immobility, edema, incontinence, moisture, and increased length of hospital stay which contribute to the development of pressure injury in burned patients<sup>(5)</sup>. Moreover infection, edema, and inflammation are considered important risk factors for pressure injury development in burned patients<sup>(6)</sup>.

Therefore, it is important to implement strategies that prevent pressure injury development in burn patients. Evidence reveals that pressure injury incidence can be reduced through the implementation of a pressure ulcer prevention care bundle<sup>(7)</sup>. The term "care bundle approach" refers to a set of three to six treatment or interventions targeted towards a specific procedure, symptom, or treatment. Robb et al. (2010) argued that the care bundle approach is more effective than simply following clinical guidelines.

The main concept of the care bundle approach is to group best evidence together, implemented at the same time, and then audited regularly. Such interventions can increase compliance and produce greater positive outcomes for patients than when carried out individually<sup>(8)</sup>.

The prevention of pressure injury in the burn patient population is clearly an area of practice in need of guidelines for care<sup>(1)</sup>. Because of the increased emphasis on patient safety and quality of care, prevention of pressure ulcers is a major concern in hospitals and other healthcare facilities as well as entire health systems worldwide<sup>(9)</sup>. The development of pressure ulcers may alter the patient's efficient improvement. The existence of pressure injury is an indicator of poor overall prognosis and may lead to premature mortality in some patients<sup>(10)</sup>.

Pressure injury prevention needs different approaches of care. No health care provider working alone, regardless of how talented, can prevent all pressure injuries from rising. Somewhat, pressure ulcers prevention require interdisciplinary actions, including establishing and carrying out a care plan that focuses on prevention, early detection and provision of proper care to such patients. Therefore, enhancing all care and elevating awareness to these issues can prevent pressure injury and keep other high risk patients free from pressure injury<sup>(11)</sup>.

### **Aim of the study**

The aim of this study was to evaluate the effect of implementing evidence-based care bundle on prevention of pressure injury in dependent burned patients.

### **Objective of the study**

- To assess effect of implementing evidence-based care bundle on improving skin health status.
- To assess effect of implementing evidence-based care bundle on reducing risk for developing pressure injury.

### **Method**

#### **Research design**

Quasi-experimental research design was utilized to conduct this study.

**Research Hypothesis:** To fulfill the aim of the study the following research hypothesis were formulated:

- H1: Study group who received evidence-based pressure ulcer care bundle will show decreased risk for developing pressure ulcers.
- H2: Study group who received evidence-based pressure ulcer care bundle will show improved skin status than control group.

#### **Setting**

This study was conducted in Burn Unit at Mansoura Governmental International Hospital.

#### **Subjects**

A purposive sample of 50 burned patients from both sex with an age range from 18-60 years and admitted to the previously mentioned setting and met the following inclusion criteria were involved in the study.

#### **Inclusion criteria**

- Expected time for hospital stay was not less than one week.
- Patients with second- or third-degree burn were enrolled.

All patients were randomly divided into 2 equal groups. A control group composed of 25 patients who received routine nursing care which consisted of patient positioning that was done in a non-scheduled pattern. A study group composed of 25 patients who received the evidence-based pressure ulcer care bundle.

## Exclusion criteria

Patients with existing pressure injury in the initial skin assessment were excluded from the study.

## Tools used for data collection

Three tools were used by the researchers for data collection.

**Tool (I):** Comprehensive skin assessment sheet.

### This tool consisted of two main parts

**Part I:** "Socio-demographic and health relevant data sheet". This part was developed by the researchers after reviewing the related literature<sup>(12)</sup>. It was used to collect personal as well as medical data of the patients such as age, gender, level of education, and risk factors for developing pressure sore as underlying disease and nutritional deficiency.

**Part II:** "Comprehensive skin assessment sheet". It was adapted from Western Australian Pressure Injury Forum, 2013<sup>(13)</sup>. It was used to assess skin state. The tool was implemented two times. First time it was conducted on admission to exclude patients with pressure ulcers from the study and then it was conducted after one week from patients' admission to assess effect of implementing the evidence-based pressure ulcer care bundle on prevention of pressure sore. It included six items namely, skin temperature, color, moisture, turgor, tissue perfusion and integrity.

**Tool (II):** Braden risk assessment scale: The Braden Scale was developed by Bergstrom, Braden, Laguzza & Holman, 1987<sup>(14)</sup>. The Braden scale was used to assess the patient's level of risk for developing pressure ulcers. This scale is a summated rating scale comprising six subscales; sensory perception, skin moisture, activity, mobility, nutrition, and friction/shear.

Each subscale is rated numerically; all except one is scored from 1 to 4, in which a score of 4 indicates no problem regarding the specific subscale, and a score of 1 indicates a significant problem. The friction and shear subscale are the only subscale that scored 1 to 3. The scores for each of the subscales are summated to give a total score ranging from 6 to 23; the lower the scores the greater the risk. A total score of 15-18 indicates mild risk, a total score of 13-14 indicates moderate risk, a total score of 10-12 indicates high risk and a total score  $\leq 9$  indicates very high risk. Intraclass Correlation Coefficients for Braden scale sum scores were 0.90 (95% CI: 0.88–0.92) and 0.88 (95% CI: 0.85–0.91) respectively, and corresponding Standard Errors of Measurement were 1.00 and 0.98. 95% limits of agreement were  $-2.8$  to  $2.8$  and  $-2.7$  to  $2.7$  respectively.

**Tool III:** Evidence-based pressure ulcer care bundle: this tool was adapted from National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance, 2014<sup>(15)</sup>. It was used to implement the desired care on the study group patients. It consisted of six main items considering with supporting body surface, inspecting skin, keeping moving and repositioning, incontinence care, nutrition and hydration and preventive skin care measures.

## Method

An official approval for conducting the study was obtained from the head of Burn Unit at Mansoura Governmental International Hospital. A written consent was taken from patients or their families. Confidentiality of the collected data and patient's right to refuse or withdraw from the study was maintained. A pilot study was carried out on 10 % of patients who were not included in the actual study sample. The pilot study was carried out to ensure the clarity and applicability of all items of the tools and all necessary modifications were done. Data was collected over a period of three months from September 1, 2018 to November 30, 2018.

## Phases of data collection

### Assessment phase

During this phase data was collected from both groups using tool I to assess socio-demographic characteristics, clinical data, and skin characteristics. The researchers excluded patients who were already suffering from pressure ulcers on initial skin assessment. Tool II was utilized daily for one week to assess whether patients' risk for pressure ulcer development increase or decrease with or without implementation of the evidence-based pressure ulcer care bundle.

## Preparation phase

During this phase the researchers prepared environment which was calm, free from external stimuli and interruption by closing doors and windows to maintain patients' privacy and promote relaxation. The researchers prepared all supplies that needed for the study group which included nonirritant soap, gentle wash gauze, a barrier product, skin moisturizer, air mattresses, small pillows that were applied on non-burned high-risk areas of the skin such as heels and sacrum.

**Evidence- based pressure ulcer nursing care bundle implementation phase:** During this phase the researchers implemented Tool III of the study which was the evidence-based pressure ulcer care bundle. It included six main items which repeated daily for one week:

1. An air mattress was used.
2. Skin was inspected with particular emphasis over bony prominences.
3. Moving and repositioning was kept through:
  - Patient position was changed every two hours.
  - Pressure relief lifts (leaning to the side, leaning forward, leg lift, and lying down) were applied every 30 minutes for duration of 30 seconds.
  - Conscious patient was instructed to use manual handling assistances
  - (such as trapeze bar or bed linens to help lift and reposition).
  - Patients were put in a 30° - 40° side-lying or flat position in bed.
  - A barrier product was applied for excessive moist skin and a moisturizer was applied for dry skin.
1. Bed linen was kept clean, dry and free from wrinkles.
2. Patients were assessed for nutrition deficiency using tool I.
3. Preventive skin care measures:
  - Avoid perfumes and other ingredients that may bother the skin.
  - Don't massage skin that is at risk for pressure sore because it becomes a fragile skin that is easy to be broken.

## Evaluation phase

During this phase the researchers reassessed each patient in the study and control groups using post comprehensive skin assessment sheet and Braden risk assessment scale to evaluate the effect of implementing evidence-based pressure ulcer care bundle on prevention of pressure sore for the study group.

## Statistical analysis

All statistical analyses were performed using SPSS for windows version 23.0 (SPSS, Chicago, IL). Data were tested for normality of distribution prior to any calculations and were of normal distribution. Continuous data were expressed in mean  $\pm$  standard deviation while categorical data were expressed in number and percentage. The comparisons were determined using Student's t test for variables with continuous data. Chi-square test was used for comparison between variables with categorical data. Statistical significance was set at  $p < 0.05$ .

## Results

**Table 1.** Socio-demographic description of both groups

Items	Study group		Control group		Chi-Square test X <sup>2</sup> P
	No = 25	%	No = 25	%	
Age (in years)					
18-30	3	12.0	4	16.0	
31-40	6	24.0	8	32.0	
41-50	9	36.0	4	16.0	
51-60	7	28.0	9	36.0	
Mean ± SD	44.00 ±10.49		47.60 ± 13.86		
Gender					
Male	11	44.0	8	32.0	0.764
Female	14	56.0	17	68.0	0.561
Marital status					
Married	19	76.0	22	88.0	1.220
Unmarried	6	24.0	3	12.0	0.232
Educational level					
No formal education	8	32.0	7	28.0	0.981
Read& write	5	20.0	8	32.0	0.913
Basic learning	5	20.0	4	16.0	
Secondary	2	8.0	2	8.0	
University &above	5	20.0	4	16.0	

Table 1: shows the socio-demographic characteristics of the study and control groups. It can be seen that the mean age of the study and control groups was 44.00 ±10.492 and 47.600 ± 13.868 respectively. As regards to gender, female patients represented 56% of the study group and 68% of the control group. Moreover, 76% and 88% of the study and control groups were married. Concerning level of education, 32.0% of the study group had no formal education while 32% of the control group read and write. It can be seen that there was no significant difference between the two groups regarding socio-demographic characteristics.

**Table 2.** Risk factors for developing pressure injury in the study and control groups

Items	Study group		Control group		Chi-Square Test X <sup>2</sup> P
	No = 25	%	No = 25	%	
Cardiovascular diseases (Hypo and Hypertension)					
Yes	16	64.0	17	68.0	0.089
No	9	36.0	8	32.0	1.000
Altered level of consciousness					
Yes	12	48.0	15	60	0.725
No	13	52.0	10	40	0.571
Nutritional deficiency					
Anemia	17	68.0	20	80.0	0.936
Hypo-albuminemia	8	32.0	5	20.0	0.520
Under weight	8	32.0	10	50.0	

Endocrine Disorders (Diabetes mellitus)	13	52.0	6	24.0	4.160
Yes	12	48.0	19	76.0	0.079
No					

Table (2): shows risk factors for developing pressure injury in the study and control groups. It can be noticed that 64.0% and 68.0% of the study and control groups had cardiovascular diseases respectively. Concerning neurological status, 48.0% and 60.0% of the study and control groups had altered level of consciousness respectively. In relation to nutritional deficiency, 68.0% and 80.0% of the study and control groups had anemia while, 32% and 20% of the study and control groups had hypoalbuminemia respectively. Regarding endocrine disorders, 52.0% of the study group had diabetes mellitus, while 24% of the control group had diabetes mellitus. It can be noticed that no significant difference was detected between the two groups as regards to risk factors for developing pressure ulcer.

**Table 3.** Comparison between comprehensive skin assessment pre and post evidence-based pressure ulcer care bundle of the study and control groups

Skin assessment	Study group				Control group				Chi-Square test X2 (p)a	Chi-Square test X2 (p)b
	Pre		Post		Pre		Post			
	No	%	No	%	No	%	No	%		
<b>Temperature</b>										
• Normal	8	32.0	16	64.0	10	40.0	6	24.0	2.032 (0.566)	11.273 (0.010)*
• Localized heat	14	56.0	9	36.0	10	40.0	13	52.0		
• Cool	3	12.0	0	0.0	4	16.0	1	4.0		
• Fever	0	0.0	0	0.0	1	4.0	5	20.0		
<b>Color</b>										
• Pink	15	60.0	13	52.0	9	36.0	6	24.0	3.136 (0.208)	6.348 (0.042)*
• Pallor	8	32.0	9	36.0	14	56.0	9	36.0		
• Erythema	2	8.0	3	12.0	2	8.0	10	40.0		
<b>Moisture</b>										
• Moist	22	88.0	15	60.0	21	84.0	7	28.0	1.690 (0.340)	7.422 (0.024) *
• Excessive moist	1	4.0	2	8.0	0	0.0	9	36.0		
• Dry	2	8.0	8	32.0	4	16.0	9	36.0		
<b>Turgor</b>										
• Normal (< 3Sec)	18	72.0	20	80.0	20	80.0	11	44.0	0.4399 (0.508)	6.876 (0.019) *
• Impaired (>3Sec)	7	28.0	5	20.0	5	20.0	14	56.0		
<b>Tissue perfusion</b>										
• Normal	20	80.0	24	96.0	23	92.0	4	16.0	1.495 (0.417)	6.480 (0.023) *
• Decreased	5	20.0	1	4.0	2	8.0	21	84.0		
<b>Integrity</b>										
• Intact	25	100.00	17	68.0	25	100.	6	24.0	a	9.742 (0.004) *
• Pressure ulcer	0		8	32.0	0	0	19	76.0		

(p)<sup>a</sup>: comparing study and control group pre the program (p)<sup>b</sup>: comparing study and control group post the program. \*significant at  $p \leq 0.05$ . a: No statistics are computed because preprogram is constant.

Table (3): illustrates comparison between comprehensive skin assessment pre and post evidence-based pressure ulcer care bundle of the study and control groups. It can be seen that all the six items of skin assessment namely; temperature, color, moisture, turgor, integrity and tissue perfusion were significantly improved after implementation of the care bundle. Pressure ulcer represented 32% in the study group after implementation of the care bundle, while pressure ulcer represents 76 % in the control group which was statistically significant. On the other hand, there were no statistically significant differences between the two groups pre implementation of evidence-based care bundle regarding all items of skin assessment.

**Table 4.** Distribution of the study and control groups according to Braden risk assessment scale in the 1st – 4th and 7th day

Braden risk assessment scale	Study group			Control group			t test (p) <sup>a</sup>	t test (p) <sup>b</sup>	t test (p) <sup>c</sup>
	1 <sup>st</sup> day	4 <sup>th</sup> day	7 <sup>th</sup> day	1 <sup>st</sup> day	4 <sup>th</sup> day	7 <sup>th</sup> day			
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD			
	11.320 ±1.345	13.240 ±1.128	15.280 ± 1.646	10.720 ±1.429	11.680 ±1.281	11.160 ±1.700	1.528 (0.133)	4.567 (0.000)*	8.705 (0.000)*
Friedman test (p)1	43.670 (0.000)*			4.923 (0.085)					

p) 1: comparing the severity of risk in 1st, 4th and 7th day in each group. (p) a: comparing the study and the control group in the 1st day. (p) b: comparing the study and the control group in the 4th day.

(p) c: comparing the study and the control group in the 7th day. \* Significant, at  $p \leq 0.05$ .

Table (4) illustrates distribution of the study and control groups according to Braden risk assessment scale in the 1<sup>st</sup> – 4<sup>th</sup> and 7<sup>th</sup> day. It can be noticed that in the study group, in the first day, patients were high risk for pressure ulcer development with mean score (11.320 ±1.345). The risk was decreased in the fourth day with mean score (13.240±1.128) and in the seventh day there was low risk for pressure ulcer development with mean score (15.280 ± 1.646). A significant difference was found within the study group during the follow up days ( $p = 0.000$ ). While in the control group, no significant difference was found within this group during the three follow up days ( $p = 0.085$ ). Also, it can be noticed that a significant difference was found between the study and control group regarding Braden risk assessment in the fourth and seventh day of follow up. However, no significant difference was noted in the first day between the two groups.

## Discussion

The aim of the current study was to evaluate the effect of implementing evidence-based pressure ulcer care bundle on prevention of pressure injury in dependent burned patients. It is noticed from our study that the majority of the study and control groups were in age group ranged from 41 to 50 years and 51 to 60 years respectively, the mean age was 44.00 ±10.492 and 47.600±13.868 in the study and control group respectively. As regards to gender, female patients were more prevalent in both study and control groups. This finding was congruence with a similar study conducted by Tayyib N, 2016<sup>(16)</sup> who reported that the mean age of the control group was 52 years and 47.5 years in study group. Also, this result was in the same line with Cano, Amparo et al 2015<sup>(17)</sup> who reported that the majority of the 305 patients who participated in the survey were female and older than 50 years of age. However, this was in contrast with Tayyib N, 2016<sup>(16)</sup> who reported that the majority of sample were males in the study and control group. Also, in a similar study conducted by Atyea A et al 2013<sup>(12)</sup> he reported that 13.3% of the sample in study group were female vs. 16.7% in control group.

Multiple studies had examined factors associated with development of pressure injury such as nutritional deficiency, increased humidity, immobility, reduced tissue perfusion, sedation, and co morbidities like diabetes mellitus and vascular disease<sup>(18)</sup>. In this study, more than half of the patients in both groups had cardiovascular diseases which contribute to decreased tissue perfusion and increased risk for pressure injury, moreover, nearly half of the sample in the study group and more than half of the sample in the control group had neurological disorders; decreased level of consciousness is considered a high risk factor because of the effect of immobility on skin tissue perfusion. In relation to nutritional deficiency, the highly percent of the studied samples in each group had nutritional deficiency namely; anemia, hypo-albuminemia and underweight. It is well known that malnutrition alters immune function and delay wound healing. Regarding endocrine disorders, more than half of the study group had endocrine disorders, while more than two thirds of the control group did not have endocrine disorders. These results come in consistent with S B Ladd, et al 2018<sup>(5)</sup> who reported that poor nutritional status, decreased tissue perfusion, immobility, edema, incontinence, moisture, and length of stay are amongst the identifying risk factors for pressure ulcer development in burns patients. Also, Kohler, K 2015<sup>(6)</sup> reported that some risk factors for pressure ulcer development in burn patients are: pressure, infection, edema, and inflammation.

The results illustrate that in the first day of assessment using Braden risk assessment scale, the study group patients showed a high-risk score for developing pressure ulcer while in the 4<sup>th</sup> day, they were moderately at risk for developing pressure ulcer. In the seventh day, the studied group patients were at low risk for developing pressure ulcer. A significant difference was found among three follow up days in this group. On the other hand, the control group patients were high risk for developing pressure ulcer in the three follow up days. No significant difference was found among three follow up days in this group.

These results were in accordance with Atyea A, et al 2013 <sup>(12)</sup> who reported that the majority of studied sample (more than 60%) had sever risk for pressure ulcer development of both groups in the day of admission and the risk for pressure ulcer development had been decreased for the study group at 7<sup>th</sup> day. On the other hand, Tayyib N, 2016 <sup>(16)</sup> reported that, Braden Scale scores showed that the majority of participants in both groups were at high risk for pressure ulcer development.

From the previous findings, it was obviously seen that the hypothesis of this study was accepted as study group who received evidence-based pressure ulcer care bundle showed decreased risk for developing pressure ulcers which supported the first hypothesis and showed improved skin status than control group which supported the second hypothesis.

## **Conclusion**

This study showed that there was a successful significant reduction in the development of pressure injury in the intervention group of burned patients. All the six items of skin assessment namely; temperature, color, moisture, turgor, integrity and tissue perfusion were improved significantly after implementation of the care bundle. Significant difference was found within the study group during the follow up days ( $p= 0.000$ ). It can be said that implementing evidence-based care bundle for preventing pressure ulcer plays a major role in protecting patients from developing pressure injury and prevent complications associated with ulcer. It is recommended to provide in-services educational programs for nursing staff regarding care of high-risk patients for developing pressure ulcer, and to apply more researches regarding this area.

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