

The Effectiveness of Preventive Nursing Care Based on Braden Scale on the Incidence of Pressure Ulcers in ICU Patients: A Clinical Trial Study

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Abstract

Background: Pressure ulcer is a common problem in ICUs and its prevention is one of nurses' duties.

Aim: The present study was performed with aim to evaluate the effectiveness of preventive nursing care based on Braden's scale on the incidence of pressure ulcer in ICU patients.

Method: This clinical trial study was performed on 72 patients admitted to the ICUs of Golestan and Imam Khomeini hospitals of Ahvaz in 2020. The preventive care based on Braden scale was performed for 6 days in the intervention group. Routine care was provided for the control group. The rate and duration of pressure sores were measured based on Braden scale at the beginning of the study, every 48 for 3 times for the intervention group. The data was collected by demographic information questionnaire, Braden scale, and Pressure Ulcer Scale for Healing (PUSH).

Results: The pressure ulcers occurred less in the intervention group (2.8%) than in the control group (8.3%), but this difference was significant ($p=0.614$). There was a significant difference between the two groups in terms of Braden's subscales during the intervention period (first, second and third 48 hours) ($p<0.05$). Preventive care increased the length of time required for the occurrence of pressure ulcers in the test group.

Implications for Practice: The results showed that the intervention based on the Braden scale reduces pressure ulcers, therefore it is recommended that nurses carry out care interventions based on the Braden scale to improve the quality of care and prevent pressure ulcers among ICU patients.

Keywords: Braden scale, Health care quality, Intensive Care Units, Pressure ulcer, Nursing

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Introduction

A pressure ulcer is a common phenomenon in intensive care units (ICUs) and its treatment, in addition to imposing heavy costs on the health system, prolongs the duration of treatment and causes complications such as ulcer infections (1,2). This complication, which affects more than 1.3 million adults worldwide each year, has a prevalence of 3 to 30% and an incidence of 1 to 50% in developed countries (3). On average, pressure ulcers with a prevalence of 10.9% in the United States and 25% in Iran affect 19% of hospitalized patients (4). Since pressure ulcers may lead to death, prolonged treatment, increased treatment costs, and generally irreparable complications for the patient and family, investigation of its incidence, causative factors, and prevention along with efficient training of the workforce should be considered in the priorities of health care systems worldwide (5).

Regarding to the undesirable consequences and high cost of pressure ulcer treatment, the prevention of its occurrence has been considered as the first measure because prevention is the most effective way to solve this problem and the high quality of nursing care is the main key in overcoming this problem (6). Since in designing a detailed care plan for each patient in order to prevent the development of pressure ulcers, it is necessary to determine how much the patient is at risk of developing pressure ulcers, the tools available in this field have been examined (7). Braden scale is one of the most widely used methods for assessing the risk of pressure ulcers incidence in the world (8). Despite the existence of valid tools and strategies such as Braden scale for the prevention of pressure ulcers, due to the lack of adequate training in the use of these scales, the prevalence of these ulcers is still significant (9).

The study by Tallier et al. (2017) have emphasized the inadequate preventive measures taken by nurses to prevent pressure ulcers (10). The lack of effective care planning and no sufficient and valid criteria for prevention of pressure ulcers are among the important deficiencies in the quality of the prevention methods (6). This issue leads to scattered and non-systematic use of care as well as the application of nurses' personal tastes in the selection and implementation of care, which can reduce the quality and effectiveness of the prevention methods (11). The use of more human approaches in the care process of ICU patients with the aim of improving the quality of care has received increasing attention (12). Therefore, the need to implement these tools is seriously felt, not only for assessing the risk of developing pressure ulcers, but also for developing and applying preventive care. Braden tool is used as a method of predicting the risk and occurrence of pressure ulcers in patients. But, the aim of this study is to turn this scale into a model for nursing interventions to prevent pressure ulcers, not just predict them. Therefore, the present study was conducted with aim to investigate the effectiveness of preventive nursing care based on Braden's scale on the incidence of pressure ulcer in ICU patients.

Methods

This single-blind clinical trial study was conducted on 72 patients admitted to the ICUs of Golestan and Imam Khomeini hospitals of Ahvaz in 2020. The person evaluating the results was unaware of the group assigned to the samples. According to the previous study (10), the sample size was determined with a confidence interval of 95% and a power of 80%, $X=66.21$, $X_2=62.59$, $S=0.47$, $S_2=1.31$ using the means comparing formula. The sample size was calculated as 27 samples for each group. Considering 15% attrition rate, the final sample size was set at 36 per group. Samples were selected through easy non-probability method, then they were divided into two groups of intervention and control using permuted block randomization with a block size of 6. Finally, 12 blocks with a size of 6 were formed; in each block, 3 people were assigned to the experimental group and 3 people to the control group.

The inclusion criteria were age > 18 years old, ICU hospitalization, complete immobility due to various medical reasons, no sign of pressure ulcers at the time of admission to the ward, no underlying skin diseases, and obtaining a score of 14 or less on Braden scale. The reluctance or withdrawal from the study and the death of the patient at any time during the study were considered as the exclusion criteria.

The data collection tools included the demographic information questionnaire, the patient's medical information questionnaire, and Braden pressure ulcer risk assessment scale for assessing the incidence of pressure ulcers after the intervention. The Braden scale consists of six subscales including sensory perception, skin moisture, activity, mobility, nutrition, and friction. The scores obtained from this tool vary between 6 and 23. Accordingly, the risk of developing pressure ulcers is divided into five

groups: 6 to 9, very high risk; 10 to 12, high risk; 13 to 14, medium risk; 15 to 18, low risk; and 19 to 23, no risk. Braden scale has been repeatedly validated in numerous studies in different countries. The convergent validity of this scale is 0.22 and $p < 0.0001$. Moreover, the predictive power of this scale for the diagnosis of pressure ulcers is reported to be 0.813 (CI 0.797- 0.828, $p < 0.0001$), and inter-rater reliability was 45.9% (13). The Cronbach's alpha coefficient has also been reported to be moderate to high for this instrument (0.722) (14). In Iran, in the study of Amirifar et al. (2013), the predictability of this tool has been reported as desirable (CI: 1.12-37.87), OR=6.51 (15). In addition, the Pressure Ulcer Scale For Healing (PUSH) was used to assess the incidence of pressure ulcers. Its validity and reliability have been reported to be 0.97 ($P < 0.05$) in several prospective cohort studies (16).

The researcher started sampling after receiving the ethics code, an introduction letter, and a written permission from the Research Deputy of the university and the Management of Golestan and Imam Khomeini Hospitals in Ahvaz. The researcher gave the necessary explanations about the goals and the importance of the study and the confidentiality of the information to the participants in the study. Written consent was obtained from eligible individuals who desired to participate in the project.

The nurses in charge of patient care in the intervention group participated in a session held by the researcher during the shift about the importance, principles and application of preventive care for pressure ulcers. The method of conducting the study and the checklist of care instructions were justified based on the Braden scale that was attached to the patients' files. In this meeting, in order to increase the motivation and attention of nurses, their opinions were also obtained and each of the checklist care items was discussed separately in the group discussion. Then the researcher took the responsibility of monitoring care implementation and completing the checklists in all shifts and performed the intervention on a daily basis. The researcher and the assistant researcher helped the medical staff during the intervention and nursing care provision and provided the necessary tips. Braden scale was applied by the researcher every 48 hours for 3 times at the beginning of the study. After 6 days, the amount and duration of pressure ulcers were monitored and recorded based on the "push" tool. Finally, the score of each subscale was determined each time, and through the aggregation of the scores, the total score of each sample was calculated on the Braden scale. In addition, the impact of the intervention was comparable in each of the tool classes.

The control group received routine care based on the common program of the department, including a part of the planned nursing care that was carried out in the form of a checklist of nursing interventions for the intervention group, including changing the patient's position every 2 hours, keeping the skin clean and dry, the use of wavy mattress, direct examination and observation of pressure ulcer prone areas by the nurse in each shift, feeding of patients using gavage powder, use of sponge and lukewarm water for bathing patients.

The continuous variables results were reported as mean \pm SD. The Shapiro-Wilk test was used to check the normality of the quantitative data, which were normally distributed. For this reason, we used parametric tests in this analysis. Comparison of the means of two groups was done with independent T-test and the means were compared over time with the repeated measures variance test. Analysis of covariance test was used to control the confounding factors. Categorical variables were compared using the Chi-square or Fisher's exact test. $P < 0.05$ were considered statistically significant. The obtained data were entered into SPSS software (version 22) and interpreted by descriptive and analytical statistical tests.

Results

A total of 72 patients enrolled in the study and data from 36 patients in the control group and 36 in the intervention group were analyzed (Figure 1).

The results of t-test showed that there was no significant difference between the two groups in terms of age (45.10 ± 70.56 years in the intervention group and 47.72 ± 11.69 years in the control group, respectively) ($p = 0.444$). In addition, Chi-square test found no statistically significant difference between the intervention and control groups regarding weight, sex, underlying diseases, and being under ventilation (Tables 1). As shown in Table 2, pressure ulcers occur less in the intervention group (1; %2.8) than in the control group (3; %8.3), but Fisher's exact test did not show this difference to be significant ($p = 0.614$).

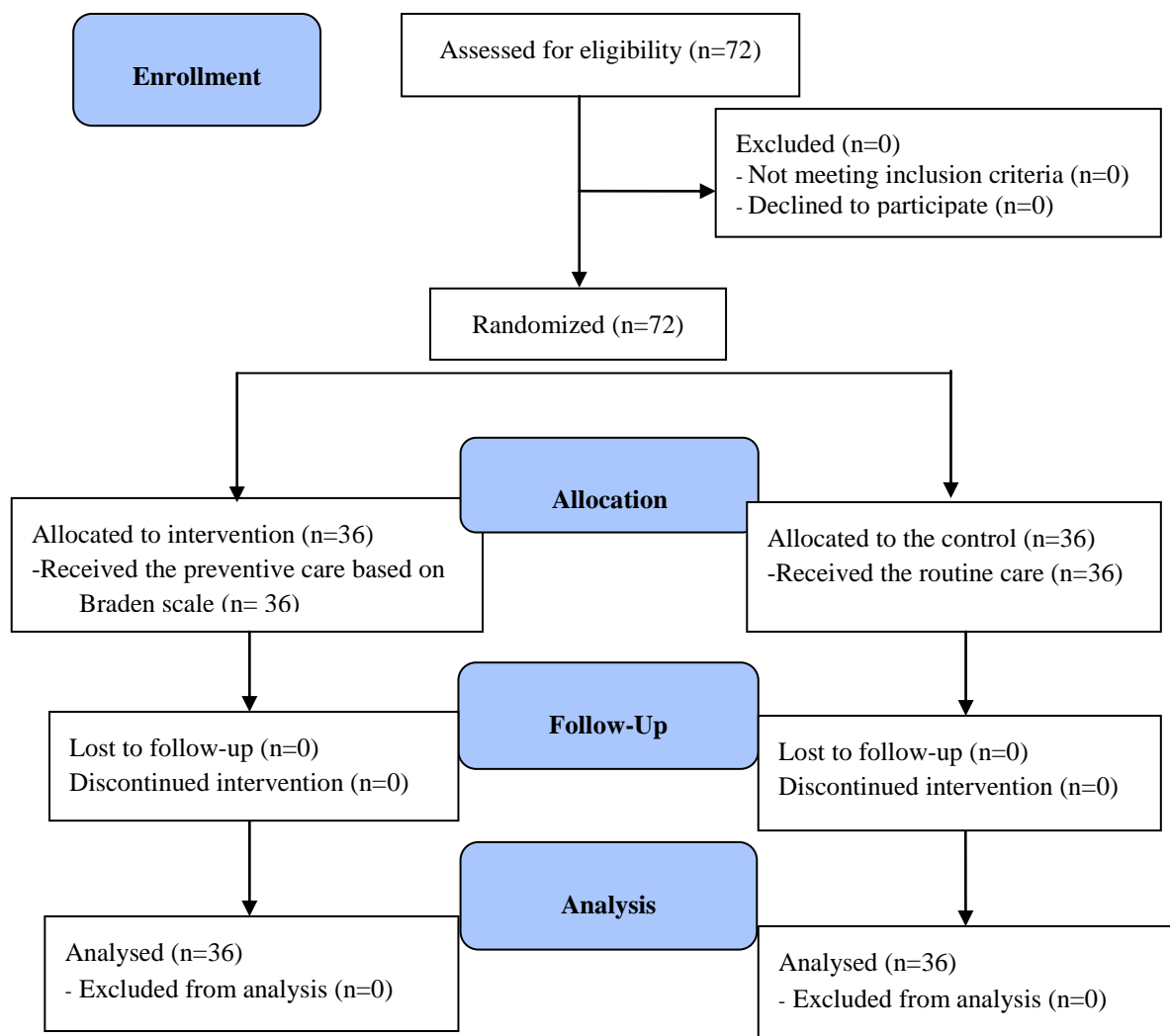


Figure 1. CONSORT flow diagram of the study

Table 1. Demographic and clinical Characteristics in the intervention and control groups

Characteristics	Control	Intervention	Intragroup comparison
Age, Mean ± SD	47.72 ±11.69	45.70±10.56	p=0.444* t=0.77
Weight, Mean ± SD	70.80± 15.37	71.77 ±10.32	p=0.754* t=0.31
Gender, N (%)	12 (33.30)	9(25)	p=0.706** χ ² =0.142
Female	24(66.70)	27(75)	
Male			
Having one or more underlying diseases, N (%)	2(5.50)	6(16.60)	p=0.152*** F=2.048
Yes	34(94.50)	30(83.40)	
No			
Under ventilation, N (%)	35(97.20)	32(88.90)	p=0.354** χ ² =0.860
Yes	1(2.80)	4(11.10)	
No			

* Independent t test; **Chi-square test; ***Fisher exact test

Table 2. Pressure ulcer incidence in the intervention and control groups

Group	Pressure ulcer		Statistics
	Yes	No	
Control, N (%)	3 (8.3)	33 (91.7)	P =0.614* F=0.2650
Intervention, N (%)	1 (2.8)	35 (97.2)	

*Fisher exact test

Repeated measures test was used to compare the duration of bed sore formation at different times between the two groups. Accordingly, there was a statistically significant difference between the two groups within the three periods of time (first to third 48 hours) ($p < 0.05$) (Table 3).

Table 3. Comparison of intervention and control groups with the Braden subscales and time trend

Subscale	Group	Mean±SD			p-value
		First 48 hours	Second 48 hours	Third 48 hours	
Sensory perception	Intervention	3.36 ± 0.61	3.16 ± 0.56	3.10 ± 0.50	<0.001*
	Control	3.23 ± 0.56	2.70 ± 0.65	2.86 ± 0.66	
Moisture	Intervention	3.40 ± 0.40	2.16 ± 0.37	1.12 ± 0.23	<0.001*
	Control	3.33 ± 0.60	2.16 ± 0.37	2.10 ± 0.34	
Activity	Intervention	1.20 ± 0.40	1.16 ± 0.37	1.10 ± 0.33	0.03*
	Control	1.06 ± 0.25	1.03 ± 0.18	1.03 ± 0.18	
Mobility	Intervention	1.93 ± 0.63	1.76 ± 0.72	1.64 ± 0.70	0.02*
	Control	1.70 ± 0.59	1.60 ± 0.49	1.59 ± 0.48	
Nutrition	Intervention	2.56 ± 0.89	2.36 ± 0.61	2.22 ± 0.54	<0.001*
	Control	3.30 ± 0.65	2.36 ± 0.61	2.30 ± 0.60	
Friction	Intervention	1.60 ± 0.56	1.90 ± 0.40	1.98 ± 0.44	0.04*
	Control	2.73 ± 0.44	1.93 ± 0.40	1.90 ± 0.37	

*Repeated measures variance test

Table 4. The correlation between the demographic and clinical characteristics and the development of pressure ulcers

Characteristics	Pressure ulcer		Statistics
	Yes	No	
Gender, N (%)	2 (50)	19 (27.9)	P=0.575* F=0.320
Female	2 (50)	49 (72.1)	
Male			
Having one or more underlying diseases, N (%)	3 (4.16)	61 (84.72)	P=0.999* F=0.001
Yes	0 (0)	8 (11.11)	
No			
Under ventilation, N (%)	4 (100)	65 (92.6)	P=0.953* F=0.001
Yes	0 (0)	5 (100)	
No			
With pressure ulcers, Mean ± SD			
Age			P=0.002** t=3.26
Yes		61 ± 11.69	
No		49.75 ± 17.1	
Weight			P=<0.001** t=7.24
Yes		87.25 ± 5.9	
No		70.35 ± 12.71	

*Fisher exact test; ** Independent t test

The findings on the relationship between demographic and clinical characteristics and the incidence of pressure ulcers in the two groups indicated no significant relationship between sex, underlying diseases, and being under ventilation and the incidence of pressure ulcers ($p>0.05$), but a significant relationship was found between age and weight with the incidence of pressure ulcers ($p<0.05$) (Table 4).

Discussion

The purpose of the present research was to evaluate the effectiveness of preventive nursing care based on Braden's scale on the incidence of pressure ulcer in ICU patients. The results showed that in the intervention group, due to the implementation of nursing interventions based on Braden scale, patients' skin care provision, taking preventive measures, and the incidence of pressure ulcers was lower than the control group who received only the routine care, but the difference was not statistically significant. Moreover, there was a significant difference between the two groups in terms of the duration of pressure ulcer formation on the first to sixth days (the first to third 48 hours). Preventive care increased the length of time required for the occurrence of pressure ulcers in the intervention group compared to the control group. According to the findings, after the implementation of care intervention based on the Braden scale, the duration of pressure ulcers formation in the intervention group was significantly longer than the control group.

The study of Ramezanpour et al. (2017) showed that the incidence of pressure ulcers was 32% in heart surgery patients. In addition, 80 out of 250 patients developed pressure ulcers, and most patients with pressure ulcers were in the age range above 70 years, diabetic, and with a history of hypertension (16). Studies on the effects of the Braden scale have shown that the implementation of nursing interventions based on Braden scale plays an effective role in the prevention of pressure ulcers. In this regard, Tallier et al. in their research showed that the implementation of a care program based on Braden scale plays an essential role in the prevention of pressure ulcers in the patients admitted to the intensive care unit (10). Fulbrook et al. (2017) also in a review of 33 studies on pressure ulcers showed that even if no reduction in the prevalence of pressure ulcers was observed in the use of the scales, but the use of scales increased the effectiveness of preventive measures and the Braden scale showed the most favorable validity and the most sensitivity (17). Moreover, the results of the meta-analysis study conducted by Avsar and Karadag (2016) indicated that Braden's scale is valid in the prevention of pressure ulcers (18,19). Floyd et al. (2021) confirmed that evidence-based interventions using the Braden scale were effective in preventing hospital acquired pressure ulcers in older adults hospitalized in ICUs (19).

In fact, the results indicate that pressure ulcer care measures such as risk assessment of pressure ulcers, skin care, using supporting surfaces, nutritional support, etc. have an effective role in controlling and preventing pressure ulcers. In this regard, Gadd et al.'s study confirmed that preventive care planning based on Braden scale may be more effective for pressure ulcers in some cases (20). The findings of the research conducted by Chen et al. (2020) showed that older age, high body mass index (BMI), long operation time and lack of nursing care were all the risk factors affecting the occurrence of pressure ulcers and pressure ulcer care based on Braden scale can reduce the incidence of pressure ulcers after spinal surgery (21). Thus, the quality of pressure ulcer care services and the use of support tools such as Braden Scale can be an important step in controlling and preventing pressure ulcers.

Among the limitations of this research was the lack of desire and resistance of some ICU nurses to fully implement the dimensions of the Braden scale for the patient, which could affect the applicability of the scale.

Pressure ulcer prevention begins with patient evaluation in the early stages of nursing care. A systematic evaluation using a valid criterion is necessary at admission or at the time of any significant change in the patient's condition. Braden scale is one of these tools which considers the basic dimensions of pressure ulcers, including the cause and severity of the wound, as well as tissue tolerance to pressure. Braden scale can be not only a predictive tool but also a nursing model to perform nursing interventions to prevent pressure ulcers.

Implications for practice

The findings of this study help to improve nurses' understanding and knowledge regarding the process of preventive nursing care. With the help of Braden scale, the care burden of nurses can be reduced, which can be effective in reducing the costs of health and patients, and on this basis and considering the time savings, it can increase the quality of care for ICU patients..

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Conflicts of interest

The authors declared no conflict of interest.

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