



## The Effect of New Guideline Training among Iranian Nurses for Pressure Ulcer Prevention

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### ABSTRACT

We aimed to determine the effect of training of new guideline on Pressure ulcer (PU) prevention in the intensive care units (ICUs). PU is the third costly disorder with high mortality and morbidity. Thus reduction of PU incidence is very important and effective step for health systems. PU is one of the most common medical conditions, occurring in both hospital and community settings, in all age groups, but mostly among the elderly, the immobile, and patients with severe acute and chronic illnesses or neurological deficits. This semi-experimental study was conducted on high-risk patients with a Norton scale score of 16, while they had daily care for PU prevention. Patients were randomly divided into two equal groups of intervention and control patients in each. The control group was assessed with routine care of PU prevention in the first three months of the study. Then the nurses were trained with the new guideline and after that the data were collected again in the second three months period. The data were analyzed through the SPSS statistical software (version 13). results showed that new guideline training program was associated with decreased risk of PU. Education of the new guideline on PU is an effective way to decrease the rate of PU in (ICUs). Training the new care guideline of the PU prevention for the involved nurses probably can reduce the incidence rate of pressure ulcer.

**Keywords:** Iranian Nurses, Intensive care unit, knowledge, New care guideline, Pressure ulcer, Training

### INTRODUCTION

According to the definition of the International Association of pressure ulcers, "PU is a localized injury to the skin and/or underlying tissue usually over a bony prominence is as a result of pressure or pressure in combination with shear". PU is divided into four group based on the stages of injury: the first stage being non-blanchable erythema of intact skin, the second stage with partial thickness skin loss involving epidermis, dermis or both, the third stage having full thickness skin loss involving damage to or necrosis of subcutaneous tissue and the fourth stage with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures (NPUAP/ EPUAP 2009). The high risk groups for PU are immobile and hospitalized patients particularly the elderly, spinal cord injury patients, hospitalized patients in Intensive Care Units and those undergoing major surgeries [1]. Pressure ulcer risk factors are classified into internal and external factors. The main external factors include shear force, friction force, humidity and pressure. The most important internal predisposing factors include age above 70 years old, malnutrition, urinary incontinence, consciousness disorders, sensory-motor disorders, systemic or multisystem diseases such as diabetes, cardiovascular diseases, respiratory disorders, anemia, obesity, leanness, stroke, neurological disorders, sepsis, hypotension, and pregnancy [2]. Despite major ongoing efforts on improvement of the quality of care services around the world, the number of PU patients is widely increasing in most developing countries. Therefore PU is one of the main problems of expanded acute health centers [3]. Predicting the risk of PU is one of the priorities in nursing care. Risk assessment is the first step in PU prevention because it helps nurses allocating adequate preventive interventions [4]. For predicting PU more than 40 various scales have been developed to identify at risk individuals, for example, Braden, Norton, Waterlow, Song and Choi, Cubbin and

Jackson, EVARUCI, Suriadi and Sanada, Modified Norton and Modified Braden scales. Although most of these tools have not been thoroughly tested for their reliability and/or validity, many of the scales are just modifications of original scales [5]. "The most frequently used and tested scales are those by Braden, Norton and Waterlow" [6]. In Iran, currently used tool is the Norton Scale. In other countries, the Braden Scale is used widely, also Waterlow Scale in the UK [7].

### **Background**

Based on the reported studies incidence and prevalence rate of PU are different across countries. The highest incidence rates of PU have been reported among the elderly by 70%, According to the review published by Riordan the incidence of PU were varies in hospitals from 4.7 to 32.1% while, it was between 8.5% and 22% in nursing homes [8]. At the same time, the prevalence of PU was different in other countries. For example; 8 % to 60% in US, 3.3% to 18% in Japan, and 8.3% to 25.1% in Canada and Australia [9,10,11]. According to the study was conducted in (the North West of Iran), the rate of PU was different between general and Specialized hospitals from 10.1% to 21% respectively [12]. In the other study which is carried out in Shiraz, the prevalence of PU was reported 30% in internal, surgery and orthopedics wards [13]. While, it was reported around 8% in the educational hospitals in Birjand city [14]. PU is considered as the third highest costly disorder after cancer and cardiovascular diseases and its cost depends on its intensity and stage. According to a recent study, PU imposed a cost around ten million dollars for the US Government in 2006 [15]. This disorder considered as the fourth preventable medical complication in the US. PU causes pain and increases the risk of hospital infection and also can add several days to the patients' length of hospital stay [16, 17].

Considering the fact that PU is one of the major problems of patients hospitalized in hospitals or nursing homes, prevention and timely treatment of PU are the main issue need to be taken into account [18]. Being parallel with improvement quality of nursing care as the most effective measure of nursing implication; evaluation of predisposing factors, correct performance of the planned interventions, and proper assessment of the effect of these interventions can lead to prevent PU. Therefore, increasing nursing knowledge and improving their skills are seems to necessar in this field [19,5]. Moreover, increased knowledge about PU prevention among nurses not only improves the quality of PU care but also reduces hospital stay days, and the number of patients suffering from this complication [20]. Several studies have shown the positive effect of training programs on the nurses' knowledge, attitudes and skills for reducing the prevalence and incidence of PU. According to the study was conducted in Australia, the incidence of PU reduced from 13.78% to 5.15% followed by 3 years nurses' on nurses training for PU prevention [21]. The other study showed that instruction on preventive actions reduced the incidence of PU and led to 700 dollars saving for each patients' costs [22]. Since 1990, PU has been considered as a negative nursing event which is important from clinical, social, and economic points of view as well as its effects on the patients' quality of life [23]. Today, PU is known as a defined index of care quality for the health and treatment organizations. While a limited numbers of studies have been conducted on PU and there is no study about the effect of training on PU prevention in Iran. Initially, to estimate the prevalence of PU, we performed a study on 355 patients in three health, treatment and educational university hospitals in the Urmia city of Iran. We reported the prevalence of PU 39.2% in our centers [24]. The study was also revealed that the prevalence of PU in patients in intensive care units was the highest percentage (23.38%) in comparison with the other wards. It is therefore decided that to train nurses with a new care methods to prevent PU in ICU wards. To train nurses, new methods introduced to the nurses in the format of a booklet. Educational and training sessions were performed to increase caring knowledge of them. The purpose of the current study was to determine the effect of new care method based on improvement of nursing knowledge and their skills in prevention of PU among patients hospitalized in ICUs.

## **MATERIALS AND METHODS**

### **Study design, place and participants**

This semi-experimental study was performed on 500 patients who hospitalized in seven ICUs in Imam Khomeini and Taleghani educational university hospitals related to Urmia University of medical sciences of Iran. Patients were selected through sequential sampling and randomly divided to the control and the intervention groups over two 3-month periods. The inclusion criteria included; patients with score of 16 in the Norton scale and more than 48 hour hospitalization in ICUs and exclusion criteria were comprised of having PU from home or other units.

### **Collecting data**

In this study, Norton scale was used for identification of the high-risk patients. According to previous studies, validity and reliability of the Norton scale have been tested several times [25, 26]. The sensitivity of the scale was reported between 89% and 62.3% and its specificity was also acceptable (from 75% to 61%). Norton scale assesses physical condition, mental condition, activity, mobility and incontinence of the patients. Each factor has a maximum possible score of 20. The total score ranges from 5 (high risk) to 20 (low risk) [7]. Also in this study a checklist

consists of three parts: firstly, the type of hospital and ward, hospitalization date, the length of patient stay and discharge date from the hospital; secondly demographic hospital; characteristics of patients and thirdly the rate, site and stage of the PU a modified according to Iran's hospital routine was applied. In order to determine the content validity of the instrument, the checklist was reviewed by ten specialists from the Urmia Nursing School. Then their suggestions were applied in the construction of the instrument.

### ***Study process***

In this study, the control group was comprised of 250 patients' hospitalization in ICUs at two hospitals for the first three months of the study. The control group did not receive any intervention other than routine PU care and assessment. After training the involved nurses, with the new care guideline, 250 patients hospitalized in ICUs were enrolled in intervention group in the second three months of the study. All the eligible patients were continuously monitored for PU detection by the researcher. Patients' monitoring was performed at the time of changing clothes, bed sheets, and their position in the morning, evening and night up to the time of discharge, transfer, or even death by the researcher and trained nurses. So that, the patients' skin were completely observed three times a day especially those points which were under pressure such as head, back, shoulder, sacrum, and heels. All these processes were repeated during three months for each group. If PU developed, its stage was determined based on the classification of the international PU association and was recorded in the patient's profile. At the end of the first three month of the study, the new guideline training was performed by holding workshops, providing booklets, installing flowcharts in form of banners, showing films and practical instruction at the patients' bedside. The educational workshop was separately held for the nurses of the two hospitals for four days through lectures using power point, and showing films related to prevention and care for PU. Educational booklet including general information of PU was prepared by the researcher and is distributed among the two hospitals nurses. In the provided booklet PU is comprehensively reviewed and required information on the prevention of PU explained for nurses. Some of the important issues included in the booklet are, risk assessment, skin assessment, nutrition, repositioning and use of support surfaces based on the new guideline had been updated according to new care evidences and standards. Moreover, an educational flowchart entitled "algorithm of PU prevention" which included a summary of evaluation of new methods for PU preventing was designed by the researcher and installed in form of banners in ICUs of studied hospitals. Finally, the correct way of patients transferring, diagnosing various stages of PU, and monitoring the skin was explained to the nurses at the patients' bedside. At the end of the second three months of the study, the researcher again monitored intervention group patients at the morning, evening, and night shifts in order to determine the incidence rate of PU before and after presentation of the new guideline. Incidence rate used to investigate the effect of the new guideline training for nurses on prevention of the PU.

### ***Ethical consideration***

The study was approved by the Research Ethics Committee of the Urmia University of Medical Sciences and also the presidents and authorities of the two involved educational hospitals, the Imam Khomeini and the Taleghani Hospitals, in the Urmia city of Iran. Patients and their relatives were informed about the study by posted notices at all the included wards and informed that their participation is voluntarily and emphasized that they could refuse their participation or leave the study at any time, and also explained them their rejection would not adversely affect their treatment or care provided by care givers. The study ethical approval code and address in Urmia university of medical sciences is: ir.umsu.rec.1391039.

### ***Data analysis***

The collected data were analysis using the SPSS software version 13. P-value < 0.001 was considered statistically significant in all analyses. Descriptive statistics were used in order to describe the data through relative and absolute frequency distribution tables. In addition, independent t-test was performed to compare the means of age, weight, length of hospital stay, Norton score. The qualitative variables were compared using chi-square test. In order to determine the effect of training the new care guideline on PU prevention, the time of occurrence of PU were compared between control and intervention groups using Kaplan-Meier method. And the amount of time takes to develop PU as quantitative variables in the Control and intervention groups, with survival analysis through the Kaplan-Meier method was used in order to determine the effect of training the new care guideline on PU prevention.

## **RESULTS**

Mean age of patients in the control group was  $60.48 \pm 19.78$  and in the intervention group was  $60.21 \pm 20.40$  years. According to independent t-test no significant difference were observed between the two groups regarding age and weight. Length of hospital stay in the control group was (22.58) and in the intervention group (15.37) days ( $P < 0.001$ ). Patients risk assessment Norton score in the control group was 8.86 and in the intervention group 8.76 ( $P$ -value= 0.005). The difference of scores between two groups was 0.1 which is not considered statistically significant and clinically is not considered meaningful changes (Table 1).

**Table 1. Comparison of characteristics of patients, hospital stay and their score of Norton scale (n = 500)**

Variables	Control group		Intervention group		t-test	P-value
	Mean	SD	Mean	SD		
Age (Years)	60.48	19.78	60.21	20.40	T= 0.15	P= 0.90
Weight (Kg)	65.45	8.75	65.42	9.29	T=0.04	P= 0.50
Length of hospital stay (Days)	22.58	22.45	15.37	11.83	T=4.49	P<0.001
Norton score	8.86	2.51	8.76	3.03	T=-0.36	P= 0.005
d.f= 498						

According to the Tables 2, the incidence of PU in the control group was 53.6% (134 patients) and 32.8% (134 patients) in the intervention group. Thus, considering the Relative Risk (RR=0.61), education caused a significant reduction in the incidence rate of PU (P<0.001) in the intervention group.

**Table 2. Comparison patients with and without pressure ulcers in the Control and intervention groups**

Pressure ulcer	Control group		Intervention group		X <sup>2</sup>
	N	%	N	%	
Yes	134	53.6	82	32.8	22.04 P<0.001 d.f= 1
No	116	46.4	168	67.2	
Total	250	100	250	100	

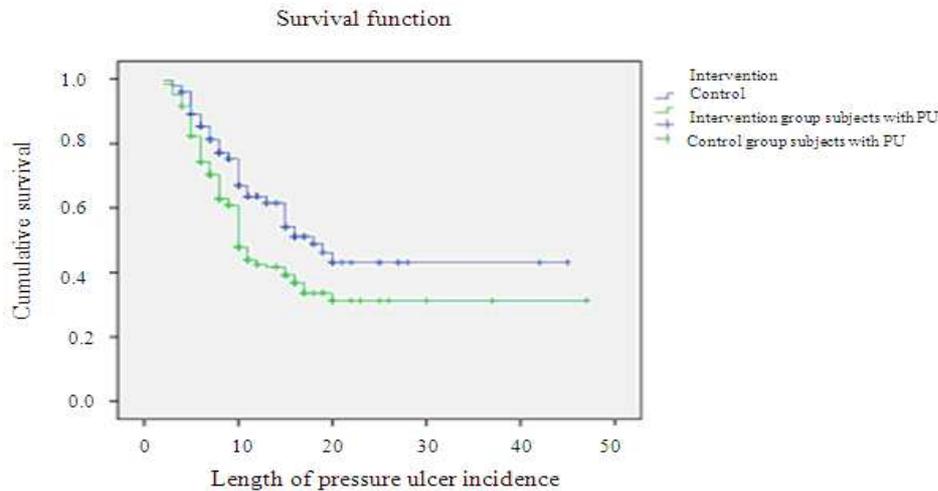
**Table3. Survival analysis**

Group	Time period of ulcer incidence	Number of at risk individuals (beginning of each time period)	Number of excluded individuals in each time period	Number of at risk individuals at the beginning of the time period	Number of infected individuals in each period	Incidence rate in each period	Probability of non-infection in each period	Cumulative probability of non-infection up to the end of each period
Control	0-4	250	2	249	21	0.08	0.92	0.92
	5-9	227	39	207.5	71	0.34	0.66	0.60
	10-14	117	32	101	34	0.34	0.66	0.40
	15-19	51	30	36	7	0.19	0.81	0.32
	20-24	14	8	10	1	0.10	0.90	0.29
	25-29	5	2	4	0	0	1	0.29
	30-34	3	1	2.5	0	0	1	0.29
	35-39	2	1	1.5	0	0	1	0.29
	40-44	1	0	1	0	0	1	0.29
45-49	1	1	0.5	0	0	1	0.29	
Intervention	0-4	250	4	248	10	0.04	0.96	0.96
	5-9	236	85	193.5	43	0.22	0.78	0.75
	10-14	108	40	88	18	0.20	0.80	0.59
	15-19	50	25	37.5	10	0.27	0.73	0.44
	20-24	15	6	12	1	0.08	0.92	0.40
	25-29	8	6	5	0	0	1	0.40
	30-34	2	0	2	0	0	1	0.40
	35-39	2	0	2	0	0	1	0.40
	40-44	2	1	1.5	0	0	1	0.40
45-49	1	1	0.5	0	0	1	0.40	

Survival analysis was performed to assess the effect of our intervention on the incidence of PU. Table 3 which is called life table shows the length of infection. The amount of time it takes to develop ulcers, non-infection, and at risk individuals in 0-4 to 45-49 day periods in the two study groups. The first column of this table shows the start time for development of PU in our study that was from 0-4 days to 45-49 days. The second column represents the number of the individuals who were at risk of PU at the beginning of each period. The third column indicates the number of the individuals excluding from the study for any reason up to the end of the time period. The fourth column shows the number of at risk individuals based on the second and third columns. The fifth column represents the number of the individuals with PU. The sixth and seventh columns indicate the probability of infection, development of ulcer, and non-infection in each time period and the sixth column is used for determining the survival curve. Finally, the eighth column demonstrates the cumulative probability of non-infection at the end of each period which is obtained through multiplying the non-infection probability by the previous time periods. For example, 21 out of the 250 patients were infected by PU within the 0-4 day period and according to the sixth column, the probability of infection was 8% in this time period. In the intervention group, on the other hand, 10 individuals with the probability of 4% were infected by PU within this time period. Thus, according to the seventh column, PU couldn't occur within the 0-4 day period in the control group with 92% probability. This trend was determined for the intervention group, as well. Moreover, in case group the patients did not get any infected PU in this period, the disorder didn't occur with 66% probability in the 5-9 day period. According to the eighth column, by

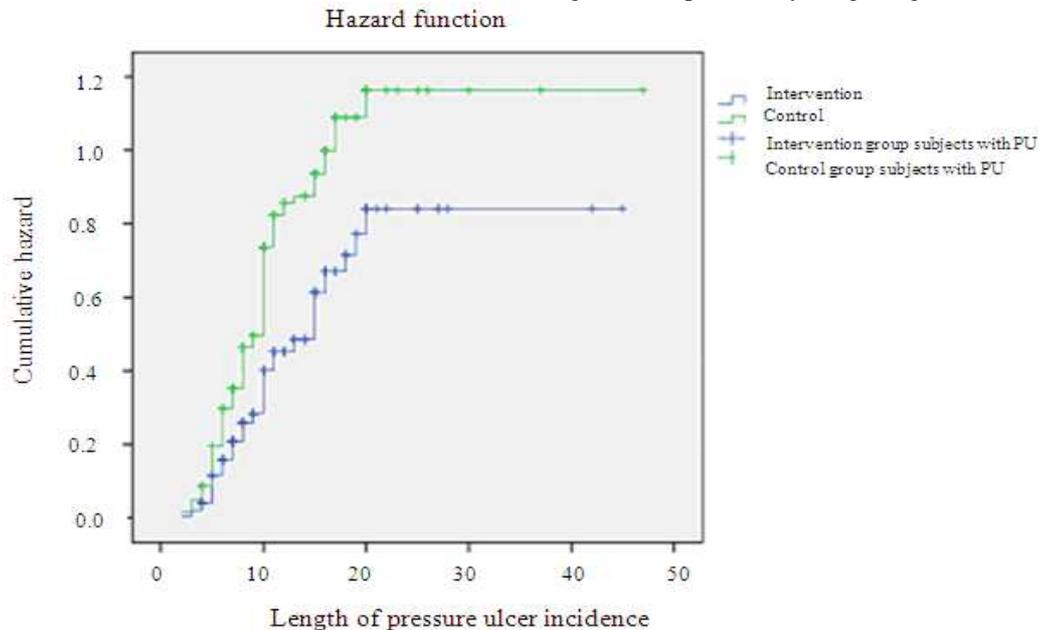
following up the patients to the end of the 45-49 day period, the probability of non-infection was 29% and 40% in the control and the intervention group, respectively. Overall, the results obtained from this table revealed the effectiveness of the intervention in reducing the incidence of PU.

Figure 1 shows the survival function of PU based on the length of its incidence. For example, after 20 days, the probability of not getting infected with PU was higher in the intervention group compared to the control group. Overall, the probability of infection decreased with the passage of time.



**Figure 1. Comparison of survival function of pressure ulcer in Control and intervention groups using Kaplan-Meier method**

Figure 2 illustrates the probability of infection in the time period. According to the above-mentioned explanations, the relationship of Figure 3 which represents the probability of infection was similar to that of Figure 1 which shows the probability of non-infection. Although the risk of getting infected with PU increased in the two groups with the passage of time, this risk was lower in the intervention group in comparison to the control group. Overall, the three Figures showed the effectiveness of the intervention in reducing the risk (probability) of getting infected with PU.



**Figure 2. Comparison of cumulative hazard of pressure ulcer over time in Control and intervention groups**

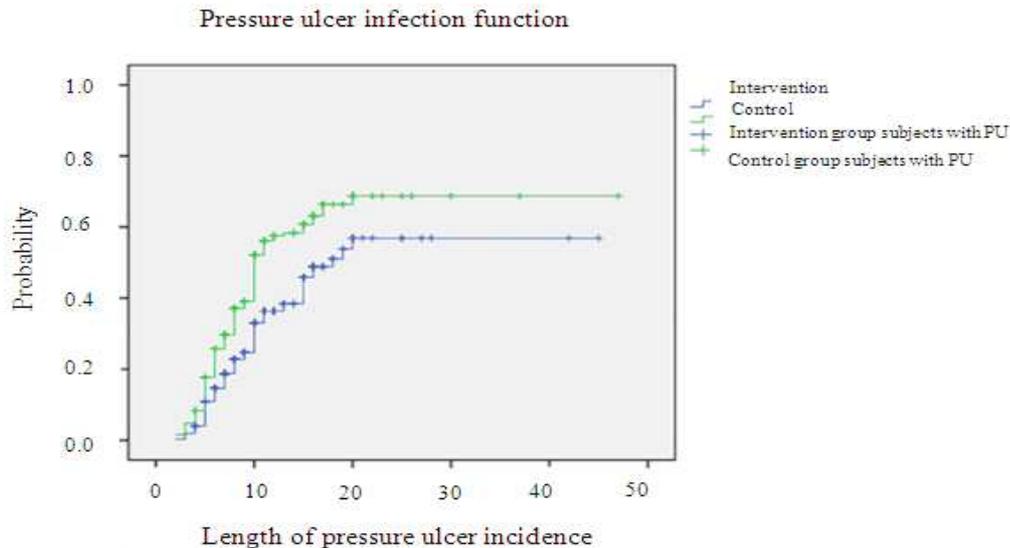


Figure 3. Comparison of probability function of pressure ulcer incidence in Control and intervention groups

### DISCUSSION AND CONCLUSION

The current study was conducted to determine the effect of new guideline on PU prevention across the intensive care units in Urmia hospitals. The incidence of PU decreased in hospitalized patients in ICUs. The incidences of pressure ulcers reported in previous studies were 27.6% in the 150 hospitalized patients in the medical-surgical ICU [28]. In Germany, the incidence of PU among the 121 patients in medical-surgical ICUs 3.3% reported. In other study of Shahin PU incidence rate vary from 3.8% to 12.4% was reported [1,29]. Moreover, Nijs the incidence of PU in surgery ICUs among 520 patients as 20.1%, Sayar also mentioned the incidence 14.3% on 140 patients were reported [30, 31]. It is therefore that, the incidence of the current study 53.6% before the educational intervention in comparison with the similar studies was quite high. The incidence of PU is considered an indicator of the quality of nursing care, and strategies to prevent PU can be evaluated by determining the incidence. Thus, considering the physical, psychological and financial effects of PU, it should be taken into account in the health and treatment organizations. This repetitive but important issue should be noted that; one of the main dimensions of any preventive action toward reduction of PU incidence is increasing the critical care nurses knowledge and awareness and also improving their clinical skills in this regard [32]. Nursing care as a complementary method with desirable preventive strategies is of greatest importance. In order to provide high-quality care services, nurses performance should be based on the best available evidences, be aware of the risk factors, at risk areas, and preventive strategies, and put their knowledge into action. A large number of nurses had a good knowledge of risk factors on prevention and at risk areas of patient body, but most of them have a little information on the effective factors to prevent the occurrence of PU incidence [2]. This study by decreasing the incidence of PU by 32% revealed that the educational intervention has a significant and positive effect on the prevention of PU. The other studies were observed similar results for example: in the study conducted to assess the effect of improving care quality on PU incidence in ICUs, PU incidence decreased from 50% to 8% using educational intervention on nurses in ICUs [33]. Another study revealed a 50% decrease in the incidence of PU by the intervention of face-to-face education of nurses based on up-to-date cares from 14.37% to 7.88% [34]. Taught to the nurses concerning the generalities and preventive cares of PU and showed that the incidence rate of this disorder reduced from 37% to 17% [35]. Also in the another study designed a guideline containing professional training for preventing PU, appropriate methods for changing the patients' position, organized methods for taking care of PU, complete instruction of skin monitoring and evaluation. Presentation of this guideline not only increased the quality of nursing care, but also reduced the incidence of PU from 0.042% to 0.04%. Even in one study with small sample size (ten patients) has been indicated the positive effect of education on the incidence rate of PU [36]. Tippet, in a prospective study in the nursing homes, PU incidence after four months from 12-25% to 0.73% by continuous education of their guideline was reported. This guideline training also led to 124 dollars reduction in the health and treatment expenditures every year [37]. Although, increasing knowledge and awareness about PU plays a major role in PU prevention, it must be considered that sufficient knowledge or continuous education solely cannot be effective in reducing the incidence of PU. Samuriwo (2010) believes that the caregivers in contact with patients at risk, in addition to appropriate knowledge should emphasize on improving clinical skills for taking care of PU patients [38]. Moore and Pitman (2000) believe that education alone cannot be effective in PU preventing unless it is considered as a priority by the caregivers.

PU is considered as the negative indicator of the health service quality. PU prevention requires better Understanding of the nursing about the different aspects involving in its development. Training the new care guideline of the PU prevention for the involved nurses probably can reduce the incidence rate of PU. Further research on PU prevention in healthcare settings with improvement of both knowledge and clinical skills of nursing are required.

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