

Original Article

Knowledge of Nurses Working in Intensive Care Units in Relation to Preventive Interventions for Pressure Ulcer

Ipek Köse, MSc Student

Research Assistant Cukurova University, Faculty of Health Sciences, Nursing Department, Adana, Turkey

Pınar Yeşil, PhD

Research Assistant Student. Cukurova University, Faculty of Health Sciences, Nursing Department, Adana, Turkey

Gürsel Öztunç, PhD

Professor, Cukurova University, Faculty of Health Sciences, Nursing Department, Adana, Turkey

Zehra Eskimez, PhD

Assistant Prof. Cukurova University Faculty of Health Sciences, Nursing Department, Adana, Turkey

Correspondence: Pınar Yeşil, Cukurova University Faculty of Health Sciences , Nursing Department, Adana, Turkey E-mail: pnar.yesil@gmail.com

Abstract

Background: In intensive care units where there is high risk of development of pressure ulcer, it is very important for nurses to have a good level of knowledge about pressure ulcer and to reflect this knowledge in their caring practices.

This study aims to identify knowledge of nurses working in intensive care units in relation to preventing pressure ulcer.

Method: Target population of this study, which is descriptive and cross sectional in nature is all nurses working in the Adult Intensive Care Units of a university hospital located in Adana/Turkey. The study was completed with the participation of a total number of 73 nurses. The data were collected using “Personal Information Form” and “Pressure Ulcer Preventive Interventions Information Form” and “Pressure Ulcer Treatment: Quick Reference guide”.

Results: Nurses’ total mean scores about preventive interventions for pressure ulcer was found 34.97 ± 4.43 (min:24, max: 50) on the average. Majority of them (68.5%) had undergraduate degree and 43.8% worked in the intensive care unit between 2 and 6 years. Percentages of correct responses to the sub-titles about preventive interventions for pressure ulcer was 75% for “Risk Assessment”, 72.9% for “Assessment of the Skin”, 56.9 % for “Positioning and Movements”, 85.9% for “Regulating Nutrition”, 55.4% for “Use of Support Surfaces”, 98.6% for “Education”, and 99.3% for “Keeping Records” and 66.7% for “Special Patient Groups”. No statistically significant differences were detected between nurses’ mean scores for knowledge about preventive interventions for pressure ulcer and variables such as their age, education level, years of experience, and duration of working in the intensive care unit ($p > 0,05$).

Conclusions: The findings of the present study show that the majority of the participants’ knowledge about the preventive interventions for pressure ulcer was good. Percentages of correct responses in the “Education” and “Keeping Records” areas were found to be higher than the other areas.

Key words: pressure ulcer, level of knowledge, nursing, intensive care

Introduction

Pressure Ulcer is defined by European Pressure Ulcer Advisory Panel (EPUAP) and National Pressure Ulcer Advisory Panel (NPUAP) as “localized injury to the skin and/or underlying

tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear” (EPUAP-NPUAP, 2009). Although today pressure ulcer ethology, pathology, protection, early diagnosis, and treatment methods are

known very well and there are many international reference guides on this issue, it could still be observed as a very serious problem (Katran, 2015; Lawrance, Fulbrook & Miles, 2015). According to the report prepared by American National Pressure Ulcer Advisory Panel based on the results of 300 studies conducted between 1990 and 2000, pressure ulcer incident in the USA was found 0,4-38 % in acute care areas, 2.2-23.9% in long-term care areas, and 0-17 % in home care areas (Cuddigan, Berlowitz & Ayello, 2001). This proportion is known to increase up to 56% in intensive care units (Ortaç, 2013; Kurhan & Girgin, 2007). As for Turkey, two studies conducted in all clinics of Medicine Faculties, and internal-surgical clinics, and intensive care units found pressure ulcer incidence as 7.2% and 10.4% respectively (Hug, 2001; Inan & Öztunç, 2012).

Pressure ulcer can be more prevalent in intensive care units in comparison to the other clinics. This case might result from the fact that intensive care units include patients who cannot perform their life activities independently due to unconsciousness and who need continuous care (Doğu, 2015). Some risk factors in intensive care units cause development of pressure ulcer. These factors include physical inactivity, limited mobilization, diseases that require long term confinement to bed, use of high degrees of anaesthetic, sedative, analgesic and muscle relaxant medicine, blackout, metabolic problems, circulatory abnormalities, incontinence, and mechanic ventilation (Keller, 2002; Cooper, 2013; Ortaç et al., 2013). By extending the healing process, pressure ulcer and risk factors affecting its development can cause complications such as high morbidity and mortality rates, infection, pain, depression, and prolonged hospital stay (Karadağ, 2003; Beeckman et al., 2010; Katran, 2015). Beside the physical and psychological effects, pressure ulcer increases the cost of care with its financial effects as well (Demarre et al., 2015; Katran, 2015). Pressure ulcer is one of the most costly cases after cancer and cardiovascular diseases (Shahin, Dassen & Halfens, 2009). Annual care cost is estimated to be 11 billion \$ in the United States of America and approximately between 206 and 238 million euros in the Netherlands (Lawrence, Fulbrook & Miles, 2015). Demarre et al.(2015) in their systematic review on the care cost of pressure ulcer, found that prevention of pressure ulcer cost between 2.65€ and 87.57€

daily per patient and the treatment cost ranged between 1.71€ and 470.49€.

Treatment and prevention of pressure ulcer, an important quality and care indicator for all health care institutions, require a multidisciplinary team having a holistic care approach (Gencer & Özkan, 2015; Mallah, Nassar & Kurdahi, 2015). Nurses in this team have important roles in the protection of skin integrity and prevention of the complications (Uzun, 2010). Patient evaluation in terms of risks factors and evidence-based nursing interventions applied in early period have great importance in the prevention of pressure ulcer (Uzun, 2010).

Nurses need to have sufficient knowledge, skills, and critical thinking ability on the issue in order to provide a qualified and effective care (Atılğan & Karadeniz, 2007; Doğu, 2015). This way, with their knowledge, they can decide for which patients precautionary actions could be applied as well as the preventive interventions to be used (Beeckman et al., 2010). Quality of care increases and duration of hospitalization decreases with the increase in the level of nurses' knowledge about prevention of pressure ulcer (El Enein & Zaghoul, 2011). On the other hand, insufficient knowledge of nurses or failure to reflect their knowledge in practice trigger pressure ulcer and might cause the existing pressure ulcer to get worse (Qaddumi & Khawaldeh, 2014).

This study aims to identify knowledge of nurses working in intensive care units in relation to preventing pressure ulcer.

Materials and Methods

Target population of this descriptive and cross-sectional study was 106 nurses working in the adult intensive care units of a university hospital located in Adana/Turkey. No sampling was used; the whole target population was included in the study. However, 33 nurses who did not want to participate or were on annual leave were not included in the study. Hence, the study was completed with 73 nurses working in the intensive care units between 26th June and 21st July, 2014 (68.8% participation rate).

Collection of the Data

The data were collected through “Personal Information Form” and “Pressure Ulcer Preventive Interventions Information Form” developed by the researchers in line with the

related literature. The main reference was “Prevention and Treatment of Pressure Ulcers: Quick Reference Guide” developed by European Pressure Ulcer Advisory Panel (EPUAP) and National Pressure Ulcer Advisory Panel (NPUAP).

Data Collection Tools

The Personal Information Form

The personal information form prepared by the researchers included 10 questions in relation to the participants’ age, gender, education level, years of experience in profession, the intensive care unit they work, duration of working in the intensive care unit, receiving education on pressure ulcer or not, type of education received, time of the last education received, and frequency of encountering patients with pressure ulcer (Karadağ, 2003; EPUAP-NPUAP, 2009; Cooper, 2013; Ortaç et al., 2013).

Pressure Ulcer Preventive Interventions Information Form

“Pressure Ulcer Preventive Interventions Information Form” was collected under 7 sub-titles: “risk assessment, assessment of the skin, positioning and movements, use of support surfaces, education, keeping records, and special patient groups (patients in operation)” (Karadağ, 2003; EPUAP-NPUAP, 2009; Cooper, 2013; Ortaç et al., 2013). The 50-item form, which aimed to identify nurses’ knowledge about prevention of pressure ulcer, had 31 correct and 19 incorrect statements responded as “true”, “false”, and “I do not know”. Highest score to be obtained from the form is 50. The guide was translated to Turkish with the permission of the Wound, Ostomy and Incontinence Nurses Society (EPUAP-NPUAP, 2009).

Administration of the forms took approximately 30 minutes: 5 minutes for Personal Information Form and 25 minutes for Pressure Ulcer Preventive Interventions Information Form.

Data analysis

Statistical analysis was performed using SPSS (IBM SPSS Statistics 20) package programming. Parametric methods were used for the measurements with normal distribution. In line with the parametric methods, comparison of two independent groups was done using

“Independent samples t-test” (t value), comparison of independent three or more groups was done using ANOVA test (F table value), and paired comparisons belonging to them were performed with “Tukey” and “Tamhane” tests, depending on the homogeneity of the variances.

Non-parametric methods were used for the measurements that did not display normal distribution. Comparison of two independent groups was done using “Mann-Whitney U Test (z table value), comparison of three or more independent groups with measurements was done using “Kruskal-Wallis H Test” (χ^2 table value), and the paired comparisons belonging to them were performed with “Bonferroni Correction”. Direction, significance, and degree of the relationship of the measurement values with each other were identified using Spearman correlation method. Means, standard deviations, numbers, and percentages were used as descriptive statistics. Statistical significance was taken as $p < 0,05$.

Ethical consideration

Necessary permissions were obtained from the administration of the hospital where the study was conducted and from University Clinical Research Ethics Committee; and nurses’ verbal consent was obtained prior to the study.

Results

Average age of the participants was 27.63 ± 5.88 , and 68.5% of them had bachelor’s degree. Of all the nurses, 43.8% had been working in the intensive care unit between 2 and 6 years; 19.2% worked in neurology intensive care unit, 17.8% were in internal diseases intensive care unit, 17.8% were in neurosurgery intensive care unit, 16.4 % were in general surgery intensive care unit, 16.4% were in coronary intensive care unit, and 12.4% were in anaesthesia and reanimation intensive care unit (Table 1).

56.1% of the nurses participating in the study frequently encountered pressure ulcer in the intensive care units, and 47.9% received education on pressure ulcer apart from the education they received at school. Of the nurses who received education, 65.8% had in-service training and 54.3% received education 1 year ago or less (Table 2).

Table 1: Some descriptive features of the nurses (N: 106)

Descriptive Features	n (%)
Age	
18-24	23 (31.5)
25-31	34 (46.6)
32-42	16 (21.9)
Gender	
Male	6 (8.2)
Female	67 (91.8)
Education level	
Vocational school of health	19 (26.0)
Associate degree	4 (5.5)
Bachelor's degree	50 (68.5)
Years of experience in Nursing	
Less than 2 years	16 (21.9)
2-6 years	25 (34.3)
7 years and more	32 (43.8)
Intensive Care Unit	
Anaesthesia and reanimation	9 (12.4)
Neurology intensive care	14 (19.2)
General surgery intensive care	12 (16.4)
Coronary intensive care	12 (16.4)
Internal diseases intensive care	13 (17.8)
Brain surgery intensive care	13 (17.8)
Duration of Working in the intensive care	
Less than two years	20 (27.4)
2-6 years	32 (43.8)
7 years and more	21 (28.8)

Table 2: Nurses' receiving education in relation to pressure ulcer (N:106)

Descriptive Features	n (%)
Receiving Education on Pressure Ulcer apart from school education	
Yes	35 (47.9)
No	38 (52.1)
Type of Education received	
In-service training	23 (65.8)
Congress/ symposium/seminar	4 (11.4)
Course	4 (11.4)
All	4 (11.4)
Time of the last education received	
1 Year and less	19 (54.3)
2 years and more	16 (45.7)
Frequency of Encountering Patients with pressure ulcer in the unit	
Frequently	41 (56.1)
Sometimes	28 (38.4)
Never	4 (5.5)

Table 3: Percentages of nurses' correct responses to statements in relation to the preventive interventions for pressure ulcer (N:106)

Preventive Interventions	n (%)
Risk assessment	55 (75)
Skin assessment	53 (72.9)
Positioning and movement	42 (56.9)
Regulating nutrition	63 (85.9)
Use of support surfaces	40 (55.4)
Education	72 (98.6)
Keeping records	72 (99.3)
Special patient groups	49 (66.7)

Table 4: Distributions of nurses' mean scores for knowledge about preventive interventions for pressure ulcer according to some descriptive variables

Descriptive Features	n	($\bar{X} \pm S. D.$)	Statistical Analysis	Probability (p)
Age				
18-24 (1)	23	33.57±4.92	$\chi^2=6.066$.048 Difference (1-3)
25-31 (2)	34	35.15±3.97		
32-42 (3)	16	36.63±4.19		
Gender				
Male	6	33.83±3.92	Z=-0.424	.672
Female	67	35.05±4.49		
Education Level				
Vocational school of health (1)	19	32.50±3.00	$\chi^2=6.453$.040 Difference (1-3)
Associate degree (2)	4	33.58±5.44		
Bachelor's degree (3)	50	35.70±3.96		
Years of experience in Nursing				
Less than 2 years (1)	16	32.56±3.86	F=4.189	.019 Difference (1-3)
2-6 years (2)	25	34.80±4.19		
7 years and more (3)	32	36.31±4.46		
Intensive Care Unit				
Anaesthesia and reanimation	9	38.56±7.14	F=1.773	.130
Neurology intensive care	14	33.50±2.95		
General surgery intensive care	12	35.75±2.53		
Coronary intensive care	12	34.25±2.83		
Internal diseases intensive care	13	34.46±5.92		
Brain surgery intensive care	13	34.54±3.50		
Duration of Working in the intensive care Unit	20	33.20±3.70	F=5.305	.007 Difference (1-3)
Less than 2 years (1)	32	34.53±4.04		
2-6 years (2)	21	37.33±4.80		
7 years and more (3)				
Receiving Education on Pressure Ulcer apart from school education	35	35.23±3.77	Z=-0.965	.334
Yes	38	34.74±5.00		
No				
Type of Education received	23	34.65±3.52	F=4.037	.016 Difference (3-4)
In-service training (1)	4	36.00±2.00		
Congress/symposium/seminar (2)	4	32.75±1.26		
Course (3)	4	40.25±4.35		
All (4)	19	36.11±3.90	t=1.530	.136
Time of the last education received	16	34.19±3.43		
1 year and less				
2 years and more				
Frequency of Encountering Patients with pressure ulcer in the unit	41	35.39±4.22	$\chi^2=2.725$.256
Frequently	28	34.79±4.84		
Sometimes	4	32.00±2.83		
Never				

Mean score for nurses' knowledge about preventive interventions for pressure ulcer was found 34.97 ± 4.43 (min: 24, max: 50). Percentages of the sub-titles of Pressure Ulcer Preventive Interventions Information Form was 75% for Risk Evaluation, 56.9% for Positioning and Movements, 85.9% for Regulating Nutrition,

55.4% for Use of Support Surfaces, 98.6% for Education, 99.3% for Keeping Records, and 66.7% for Special Patient Groups (Table 3).

A significant difference was detected between nurses' age and total mean scores for their knowledge about the preventive interventions for pressure ulcer ($\chi^2=6,066$; $p=0,048$). There was a

slight increase in the total knowledge scores of the preventive interventions for pressure ulcer with a slight increase in age.

There was a significant difference between nurses' education level and mean scores for their knowledge about preventive interventions for pressure ulcer ($\chi^2=6,453$; $p=0,040$). There was a significant difference between those who graduated from vocational school of health and those who had bachelor's degree ($p<0,05$). Mean scores of nurses who had bachelor's degree were significantly higher than the mean scores of the nurses who graduated from vocational school of health.

There was a statistically significant difference between nurses' years of experience in profession and their mean scores of preventive interventions for pressure ulcer ($F=4,189$; $p=0,019$). There was a significant difference between the nurses who had been working for less than two years and those who had been working for more than 7 years. Preventive interventions for pressure ulcer scores of those who had been working for more than 7 years were significantly higher than the scores of the nurses who had been working for less than 2 years ($p<0,05$).

There was a statistically significant relationship between duration of working in the intensive care unit and total mean scores for knowledge about preventive interventions for pressure ulcer ($F=5,305$; $p=0,007$). There was a statistically significant difference between those who had been working in the intensive care unit for 2 years or less and those who had been working for 7 years and more ($p<0,05$). Knowledge mean scores about the prevention of pressure ulcer was significantly higher in the nurses group who had been working in the intensive care unit for 7 years or more in comparison to the nurses who had been working for 2 years and less.

A significant difference was identified between the type of education received about pressure ulcer and total mean scores for knowledge about preventive interventions for pressure ulcer ($F=4,037$; $p=0,016$). There was a statistically significant difference between the nurses who participated only in the courses and who participated in all types of education (in-service training, congress/symposium, seminar, course) ($p<0,05$). Total mean scores of the nurses who participated in all types of trainings were

significantly higher than those of nurses who participated only in the courses.

No significant differences were detected between total mean scores for knowledge about preventive interventions for pressure ulcer and variables such as nurses' gender, the intensive care units they work, receiving education on pressure ulcer apart from the school education, time of the last education received about pressure ulcer, and the frequency of encountering patients with pressure ulcer in the intensive care unit ($p>0,05$) (Table 4).

There was a statistically significant, positive, and weak relationship between nurses' duration of working experience and total mean scores for knowledge about preventive interventions for pressure ulcer ($r=0,334$; $p=0,002$). With the slight increase in duration of working, there was a slight increase in the total mean scores for knowledge about preventive interventions for pressure ulcer.

There was a statistically significant, positive, and weak relationship between nurses' duration of working in the intensive care unit and total mean scores for knowledge about preventive interventions for pressure ulcer ($r=0,344$; $p=0,001$). With the slight increase in the duration of working in the intensive care unit, there was a slight increase in nurses' total mean scores for knowledge about preventive interventions for pressure ulcer.

Discussion

Level of intensive care unit nurses' total mean scores for knowledge about preventive interventions for pressure ulcer was found to be good (34.97 ± 4.43) in this study. In intensive care units where there is high risk of development of pressure ulcer, it is very important for nurses to have good level of knowledge about pressure ulcer and reflect this knowledge in their caring practices (Keller et al., 2002; Özdemir & Karadağ 2008; Tweed & Tweed, 2008; Beeckman et al., 2010; Sari 2013). Tweed and Tweed (2008) investigated knowledge level of intensive care unit nurses about pressure ulcer and the effect of the education program on the level of knowledge and found that nurses' level of knowledge was good before receiving education. In their study conducted in various clinics (internal, surgical and intensive care units), Enein and Zaghoul (2011) found knowledge level of nurses working in intensive

care units good (62.8 ± 5.7 , min:51.9, max:74.1). Unlike the results of the present study, nurses' knowledge level was found to be insufficient in the study conducted by Doğu (2015) with intensive care unit nurses. Although they were conducted in various clinics, numerous studies in the related literature reported nurses' knowledge about pressure ulcer as good (Pancarbo-Hidalgo, 2007; Ka'llman, 2009) or insufficient (Beeckman et al., 2011; Demarre et al., 2012, Qaddumi & Khawaldeh, 2014). These differences between the studies might be caused by the differences in the countries where the studies were conducted, differences in the clinics where nurses were working, differences in the scales used for evaluating knowledge level, and differences in the threshold score defining knowledge level.

Evaluation of patients in terms of pressure ulcer development and administration of appropriate interventions are important in terms of decreasing pressure ulcer prevalence and incidence (Atılgan & Karadeniz, 2007; Coleman et al., 2013). Irreversible damages may occur in cases where patients under risk in terms of pressure ulcer development cannot be identified well; and preventive interventions can be higher than the treatment cost of pressure ulcer (Moore & Price, 2004; Demarre et al., 2015). This study found that 75% of the nurses responded to the statements in the "Risk Assessment" sub-title correctly. Gunningberg et al. (2015), in their study conducted with nurses working in surgical and internal clinics using PUKT, found that 75.7% of the nurses responded to the "Risk Assessment" part correctly. Another study conducted with Belgian nurses and nursing aides reported that nurses received the highest scores in the "Risk Assessment" dimension. (Demarre et al., 2012) Unlike the present study, Qaddumi and Khawaldeh (2014) found that one of the dimensions that nurses scored lowest was "Risk Assessment". Nurses in the present study responded to "Risk Assessment" part of the Pressure Ulcer Preventive Interventions Information Form correctly in high proportions.

Due to decreased physical activity and loss of sense and feeling caused by the frequent use of sedation and analgesia, intensive care unit patients are under risk in terms of pressure ulcer development (Ortaç et al., 2013). Therefore, it is important for nurses to make regulations that would enable movements in bed, protect heels, use bed and mattresses decreasing pressure, and

develop frequent positioning protocol (Karadağ, 2003). Percentages for the nurses' correct responses to the "positioning and movement" and "use of support surfaces" sub-titles in relation to Pressure Ulcer Preventive Interventions Information Form was found 56.9% and 55.4% respectively. Demarre et al. (2012) conducted a study with nurses and nurse aides working in a dispensary in Belgium in order to evaluate their knowledge and attitudes and adaptations to preventing pressure ulcer guide. They found that the participants' knowledge level was low in the area of "decrease in the pressure and amount of cutting force" (26.8%).

In their study conducted with a view to identifying nurses' level of knowledge using PUKT, Gunningberg et al. (2015) found that nurses received the lowest score in the "decrease in pressure and amount of friction" part. Unlike the present study, Hulsenboom, Bours and Halfens (2007) found that 73.6% of the nurses stated that positioning was a beneficial practice in preventing pressure ulcer. Of all the nurses participating in the present study, 16.4% were found to know that the statement "blood circulation should be supported by massaging bone spurs" was wrong. In Doğu's (2015) study conducted with intensive care nurses and Hulsenboom, Bours and Halfens (2007) study conducted with nurses, they found that nurses stated areas with pressure ulcer risk could be applied massage (27.1%) and massaging was a beneficial practice (18.3%). The related literature has long indicated that massaging bone spurs for preventing pressure ulcer is not recommended (EPUAP-NPUAP, 2009; Mallah, Nassar & Kurdahi, 2015).

There was a statistically significant difference between education levels of nurses and total mean scores for their knowledge about preventive interventions for pressure ulcer. In their study conducted with nurses in health centres, hospitals (including intensive care units), and nursing houses for old people, Pancorbo et al. (2007) found a statistically significant difference between nurses' education levels and mean scores for their knowledge about preventive interventions for pressure ulcer. It was indicated that nurses who had a colleague degree had good level of knowledge. Unlike the results of the present study, no statistically significant differences were found between nurses'

education levels and mean scores for their knowledge about preventive interventions for pressure ulcer in the studies conducted by Doğu (2015) with intensive care nurses, by Qaddumi and Khawaldeh (2014) conducted with nurses who had bachelor's and MA degree, and by Saleh, Qaddumi and Anthony (2012) with nurses working in various clinics including intensive care units. The present study found that knowledge scores of the nurses having bachelor degree about the preventive interventions for pressure ulcer were higher in comparison to the nurses who graduated from health high schools. Thus, nurses who graduated from the university were more knowledgeable with preventing pressure ulcer.

Education programs on preventing pressure ulcer improve nurses' decision-making skills and decrease incidence and prevalence of pressure ulcer (El Enein & Zaghloul, 2011). Unlike what we expected, no significant differences were detected in the knowledge level of the nurses between those who received training on pressure ulcer and those who did not ($p > 0.05$). Parallel to the present study, in their study conducted with intensive care unit nurses, Doğu (2015) and Sari (2013) found no statistically significant differences in the knowledge level of nurses who received training and who did not. The related literature indicates that education is an important tool that increases knowledge (Tweed & Tweed, 2008; Beeckman et al., 2011; El Enein & Zaghloul, 2011). Uzun, Aylaz and Karadağ (2009) conducted a study with intensive care unit nurses, and unlike the present study, they found that the training received for the prevention of pressure ulcer was effective in decreasing the pressure ulcer incidence in intensive care units. The related literature indicates that the education for preventing pressure ulcer affected nurses' knowledge levels positively; and nurses who received education had better knowledge levels (Sinclair et al., 2004; Pancarbo-Hidalgo, 2007; Ka'llman & Suserud, 2009; Uzun, Aylaz & Karadağ, 2009; Beeckman et al., 2011).

No significant differences were detected between time of the last education received on pressure ulcer and nurses' knowledge levels ($p > 0.05$). In their study which investigated the effects of education programs about prevention of pressure ulcer on intensive care unit patients' knowledge level, Tweed and Tweed (2008) found that the effect of the education program on the

knowledge level continued 2 weeks after the training, but it returned to the beginning level after 20 weeks. In their study which evaluated the effects of an education program for preventing pressure ulcer, Sinclair et al. (2004) administered two tests to nurses in different times after the training and found that nurses' knowledge scores were high right after the training, but low 3 months after the training. It could be said that giving education to nurses for preventing pressure ulcer and reviewing the education systematically help to make the knowledge gained in the training permanent.

The present study found a statistically significant difference between nurses' years of experience and their knowledge mean scores in relation to prevention of pressure ulcer ($p < 0.05$). Total mean scores of the nurses who had been working in the intensive care unit for 7 years and more were higher in comparison to the nurses who had been for 2 years or less. It is somewhat expected that nurses' knowledge level increases with the increase in their years of experience. Unlike the results of the present study, Tweed and Tweed (2008) found no significant differences between intensive care unit nurses' knowledge level and years of experience. Cho, Park and Chung (2011) conducted a study with intensive care unit nurses and found that nurses with less years of experience had more interventions for the prevention of pressure ulcer.

The present study found a statistically significant difference between nurses' age and their mean scores for the prevention of pressure ulcer ($p < 0.05$). Total mean scores for nurses' knowledge about preventive interventions for pressure ulcer were found to increase slightly with the slight increase in their age. Unlike the present study, Doğu (2015) found that there was a statistically significant relationship between intensive care unit nurses' age and mean scores for their knowledge about preventive interventions for pressure ulcer; knowledge level decreased with the increase in age. As for the present study, nurses' knowledge level increased with the increase in their age.

Risk of pressure ulcer development is known to be higher in intensive care unit patients in comparison to other patient groups (Kurhan & Girgin, 2007; Ozdemir & Karadağ, 2008; Ortaç et al., 2013). 56.2% of the nurses in the present study reported to "frequently" encounter patients who developed pressure ulcer. In their pressure

ulcer prevalence conducted in a university hospital, Inan and Öztunç (2012) found that patients with pressure ulcer were seen mostly in the intensive care units. In the study conducted with patients in a surgical intensive care unit, Katran (2015) found that 20.56% of the patients had pressure ulcer development at least in one area in their body. In their study conducted with the records of 427 intensive care unit patients, Cho, Park and Chung (2011) found pressure ulcer incidence as 15%. Lahmann et al. (2005) aimed to identify pressure ulcer prevalence in 40 hospitals and 15 nursing homes and found that pressure ulcer developed mostly in patients in the geriatrics and intensive care units.

This study found that it is more common to encounter patients with pressure ulcer in intensive care units, and nurses working in intensive care units are expected to have good level of knowledge in relation to the prevention of pressure ulcer.

Conclusion

Majority of the nurses in the present study were found to have good knowledge level about preventive interventions for pressure ulcer; percentages of their correct responses to the “education” and “keeping records” areas of preventive interventions for pressure ulcer were higher in comparison to the other areas.

Pressure ulcer is a preventable health problem which is among the primary responsibilities of nurses. In this regard, nurses working in intensive care units where pressure ulcers are encountered frequently have important responsibilities. Nurses should evaluate all risk factors that could cause pressure ulcer and implement the necessary prevention interventions. In our country, where the budget allocated to health is limited, solutions to this problem could be found by conducting studies that identify nurses’ knowledge levels, organizing education programs in relation to preventive interventions, and reviewing these trainings at certain intervals.

As the present study was conducted at a university hospital, more comprehensive studies in intensive care units of various hospitals are recommended in order to generalize the study findings and identify nurses’ insufficient knowledge areas so that training programs on the issue can be planned. Besides, while evaluating nurses’ knowledge levels, investigating how

nurses reflect their knowledge in practice plays an important role in the prevention of pressure ulcer.

Acknowledgements

We would like to thank Kıymet Meses, MSc student at the Nursing Department, Cukurova University Institute of Medical Sciences, for her help in collecting data.

References

- Atılgan Y. & Karadeniz B. (2007) The evaluation of the effects of the decubitus prevention attempts in the patients whose pressure injury risk is defined early. *Journal of Intensive Care Nursing*, 11, 62-66.
- Beeckman D, Vanderwee K, Demarré L, Paquay L, Van Hecke A & Defloor T. (2010) Pressure ulcer prevention: development and psychometric validation of a knowledge assessment instrument. *Int J Nurs Stud*, 47, 399-410.
- Beeckman D., Defloor T., Schoonhoven L. & Vanderwee K. (2011) Knowledge and attitudes of nurses on pressure ulcer prevention: a cross-sectional multicenter study in Belgian hospitals. *Worldviews Evid Based Nurs*, 8, 166-76.
- Cho I., Park H. A. & Chung E. (2011) Exploring practice variation in preventive pressure-ulcer care using data from a clinical data repository. *Int J Med Inform.*,80, 47-55.
- Coleman S, Gorecki C, Nelson EA, Closs SJ, Defloor T, Halfens R, Farrin A, Brown J, Schoonhoven L & Nixon J. (2013) Patient risk factors for pressure ulcer development: Systematic review. *International Journal of Nursing Studies*, 50, 974-1003.
- Cooper K. L. (2013) Evidence-based prevention of pressure ulcers in the intensive care unit. *Crit Care Nurse*,33, 57-66.
- Cuddigan J, Berlowitz D. R. & Ayello E. A. (2001) Pressure ulcers in America: prevalence, incidence, and implications for the future. *Advances in Skin & Wound Care*, 14, 208-215.
- Demarré L, Vanderwee K, Defloor T, Verhaeghe S, Schoonhoven L & Beeckman D. (2012) Pressure ulcers: knowledge and attitude of nurses and nursing assistants in Belgian nursing homes. *Journal of Clinical Nursing*, 21(9-10): 1425-34.
- Demarré L, Van Lancker A, Van Hecke A, Verhaeghe S, Grypdonck M, Lemey J, Annemans L & Beeckman D. (2015) The cost of prevention and treatment of pressure ulcers: A systematic review. *International Journal of Nursing Studies*, 52, 1754-1774.
- Doğu Ö. (2015) An Evaluation of intensive care nurses’ knowledge and practices about pressure ulcer, care and use of care products. *J Hum Rhythm*, 1, 95-100.

- El Enein N. Y. A & Zaghoul A. A. (2011) Nurses' knowledge of prevention and management of pressure ulcer at a health insurance hospital in Alexandria. *International Journal of Nursing Practice*, 17, 262-268.
- Shahin E. S., Dassen T. & Halfens R.J. (2009) Incidence, prevention and treatment of pressure ulcers in intensive care patients: A longitudinal study. *International Journal of Nursing Studies*, 46: 413-421.
- European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel. Prevention and treatment of pressure ulcers: quick reference guide. Washington DC: National Pressure Ulcer Advisory Panel; 2009.
- Gencer Z. E & Özkan Ö. (2015) Pressure ulcer surveillance report. *Journal of Turkish Intensive Care*, 13, 26-30.
- Gunningberg L., Mårtensson G., Mamhidir A. G., Florin J, Muntlin Athlin Å. & Bååth C. (2015) Pressure ulcer knowledge of registered nurses, assistant nurses and student nurses: a descriptive, comparative multicentre study in Sweden. *Int Wound J.*,12, 462-468.
- Hug E., Ünalın H., Karamemetoğlu S. S, Tüzün S., Gürgöze M. & Tüzün F. (2001) Pressure ulcer prevalence and factors affecting pressure ulcer development in a research hospital. *Journal of Turkish Physical Medicine and Rehabilitation*, 47, 3-11.
- Hulsenboom M. A., Bours G.J. & Halfens R. J.(2007) Knowledge of pressure ulcer prevention: a cross-sectional and comparative study among nurses. *BMC Nurs*, 6,1-11.
- Inan D.G. & Oztunç G. (2012) Pressure ulcer prevalence in Turkey: a sample from a university hospital. *J Wound Ostomy Continence Nurs*, 39, 409-13.
- Ka'llman U. & Suserud B. O. (2009) Knowledge, attitudes and practice among nursing staff concerning pressure ulcer prevention and treatment – a survey in a Swedish healthcare setting. *Scand J Caring Sci*, 23, 334-341.
- Karadağ A. (2003) Pressure ulcers: evaluation, prevention and treatment. *Journal of Cukurova University School of Nursing*, 7, 41-6.
- Katran H. B. (2015) The Research on the incidence of pressure sores in a surgical intensive care unit and the risk factors affecting the development of pressure sores. *Journal of Academic Research In Nursing*, 1, 8-14.
- Keller B. P., Wille J., Van Ramshorst B. & Van der Werken C. (2002) Pressure ulcers in intensive care patients: a review of risks and prevention. *Intensive Care Med*, 28, 1379-88.
- Kurhan E. G. & Girgin K. N.(2007) Pressure ulcer care. *Journal of Turkish Intensive Care*, 5, 11-13.
- Lahmann N. A., Halfens R. J.G. & Dassen T. (2005) Prevalence of pressure ulcer in Germany. *Issues Clin Nurs*, 14, 165-172.
- Lawrence P., Fulbrook P. & Miles S. A. (2015) Survey of Australian nurses' knowledge of pressure injury/pressure ulcer management. *J Wound Ostomy Continence Nurs*, 42, 450-460.
- Mallah Z., Nassar N. & Kurdahi Badr L. (2015) The Effectiveness of a pressure ulcer intervention program on the prevalence of hospital acquired pressure ulcers: controlled before and after study. *Appl Nurs Res*, 28, 106-13.
- Saleh M. Y. N., Qaddumi, J. A. M. S. & Anthony, D. (2012) An interventional study on the effects of pressure ulcer education on Jordanian registered nurses' knowledge and practice. *Procedia-Social and Behavioral Sciences*, 47,2196-2206.
- Moore Z & Price P. (2004) Nurses' attitudes, behaviours and perceived barriers towards pressure ulcer prevention. *Journal of Clinical Nursing*, 13, 942–951.
- Ortaç Ersoy E., Öcal S., Oz A, Yılmaz P., Arsava B. & Topeli A. (2013) Evaluation of risk factors for decubitus ulcers in intensive care unit patients. *Journal of Intensive Care*, 4, 9-12.
- Ozdemir H. & Karadağ A. (2008) Prevention of Pressure Ulcers. *J Wound Ostomy Continence Nurs*, 35, 293- 300.
- Pancorbo-Hidalgo P. L., Garcia-Fernandez F. P., Lopez-Medina I. M. & Lopez-Ortega J. (2007) Pressure ulcer care in Spain: nurses' knowledge and clinical practice. *Journal of Advanced Nursing*, 58:327-338.
- Qaddumi J. & Khawaldeh A. (2014) Pressure ulcer prevention knowledge among Jordanian nurses: a cross-sectional study. *BMC Nursing*, 13, 6.
- Sarı E. (2013) Information level of intensive care unit nurses about pressure ulcer. *Akad Geriatry*, 5, 73-79.
- Sinclair L., Berwiczonek H., Thurston N., Butler S., Bulloch G., Ellery C.& Giesbrecht G. (2004) Evaluation of an evidence-based education program for pressure ulcer prevention. *J Wound Ostomy Continence Nurs.*, 31, 43-50.
- Tweed C. & Tweed M. (2008) Intensive care nurses' knowledge of pressure ulcers: development of an assessment tool and effect of an education program. *Am J Critical Care*, 17, 338-46.
- Uzun O., Aylaz R. & Karadağ E. (2009) Prospective study reducing pressure ulcers in intensive care units at a Turkish Medical Center. *J Wound Ostomy Continence Nurs*, 36, 404-411.
- Uzun Ö. (2010) Prevention of pressure ulcer in surgical patients. *Journal of Firat Health Services*, 5, 15.