

The Effects of Training on Cardiac Surgery Intensive Care Nurses' Knowledge and Practices in Prevention of Pressure Ulcers and The Incidence of Pressure Ulcers Among Cardiac Surgery Patients

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Abstract

Objective: Pressure Ulcers is described as unrelieved pressure that locally destroys the part of skin and underlying tissues which no longer in result of combination of some factors during the patient's hospitalization. This study was aimed to assess nurses' knowledge and practice in prevention of pressure ulcer among patients undergoing cardiac surgery following an educational program. **Method:** This is a quasi-experimental study, which was conducted in the two Cardiac Intensive Care Units (CICUs) at Shahid Madani Heart Hospital in Tabriz, Iran from March 1- June 15 in 2015. The study sample was composed of 334 patients and 54 nurses in two-intervention and control group. The data were collected by using three forms (socio-demographic characteristics, Pieper's The Pressure Ulcer Knowledge Test, Nursing practice self-assessment form). Data analyzed using SPSS Ver. 21, t-test and Kruskal-Wallis Test. **Results:** The findings of this study showed that there was no significant difference between the mean scores of pre-test nurses' knowledge on pressure ulcers in the control and intervention group, which was 29.77 ± 2.23 and 28.77 ± 2.08 respectively. However, there was a significant difference between the post-test mean scores of the control and intervention groups in this case, which was 29.66 ± 1.90 and 45.14 ± 2.12 respectively. In addition, there was no significant difference between the pre-test mean scores of nurse's practice in the intervention and control groups (11 and 14, respectively) ($p=1.000$), but there was a significant difference between the post-test scores, which were 93.96 ± 7 and 93.74 ± 7.74 respectively ($p=.008$). **Conclusion:** The results of the present study showed that a short educational program is able to increase the knowledge and performance of nurses regarding prevention and treatment of pressure So, such programs that are easy to use and cost-benefit to decrease the prevalence of pressure ulcer can be applied.

Keywords: Knowledge, Practice, Pressure Ulcer, Nurses, Prevention.

Introduction

Pressure Ulcer (PU)¹ is one of the most important and challenging issues in health care centers (Frykberg and Banks Bhattacharya, & Mishra, 2015; Lyder, & Ayello, 2008). It is as one of the events patient safety incidence (Organization, 2008; Thomas, & Macdonald, 2016) as well, PU is the costliest disorder after cancer and cardiovascular disease (Agrawal, & Chauhan, 2012).

Pressure Ulcers (PUs)² known as decubitus ulcers, bedsores, hospital acquired pressure ulcer or nosocomial pressure is described as

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unrelieved pressure (Agrawal, & Chauhan, 2012) that locally destroys the part of skin and underlying tissues which no longer can

¹ Pressure Ulcers

² Pressure Ulcers (PUs)

bear, shear, friction, or a combination of these factors during the patient's hospital stay (Chou, et al.,2013). PUs can grow on bony prominences of the body such as the ear, heels, elbows, back of head, sacrum, shoulder, and/or the spine and they can be as small as mild minor skin reddening and as big as severe deep craters down to muscle and bone (Zulkowski,2015; Bhattacharya, and Mishra,2015). Pressure ulcers are viewed as a burdensome and complex health problem in acute care hospitals (Wake,2010) and community health care settings in terms of patients suffering, pain, disfigurement and loss of productive time and in extreme situations pressure ulcers can cause death (McGinnis, et al.,2014). PUs also increase the workload of health care professionals and consequently increase health care costs dramatically (Martin, et al., 2017; Demarre, et al.,2015; Silva, et al.,2013), high rates of serious infection and cause pain (Jarbrink, et al.,2016; Boyko, et al.,2018), prolonged stay in hospital and re-hospitalization (Cano, et al.,2015), reimbursement and quality of life for long-term-care providers and their residents (White-chu, et al.,2011).

Presently, about 1.5 to 3 million adults suffer with pressure ulcers (Lyder, & Ayello, 2008). Every year about 60000 patients die as a direct results of pressure ulcers (Mwebaza, et al.,2014). According to the Agency for Healthcare Research & Quality (AHRQ), pressure ulcers cost the United States healthcare system an estimated \$9.1-\$11.6 billion annually (Rockville, 1994). The estimated annual cost of treating pressure ulcer in long-term care settings was estimated to be as high as US\$355 million (Thomas, 2012). Some studies which were carried out in Iran revealed that pressure ulcers are an important health problem which hospitalized patients are faced with in Iran (Sari, et al.,2014; Iranmanesh, et al.,2011; Iranmanesh, et al.,2013). Additionally, in Iran the incidence of pressure ulcer in patients admitted in ICUs is believed to be between 5.2 and 22.5%(Rafiei,2016; Reihani & Haghiri,2007).

Pressure ulcers that originally happen during surgical procedures may show up within a few hours after surgery, but most usually, they happen 1 to 3 days after surgery (Scarlatti, et al., 2011). For patients undergoing cardiac surgery, pressure ulcer incidence is reported to be up to 29.5% (Karadag, & Gumuskaya,2006; Agrawal, & Chauhan,2012) which is on a high level compared with a pressure ulcer incidence of .4% to 38% for patients in the general surgical setting (Chen, Chen & Wu,2012). The exact mechanisms that result in this increased prevalence are not entirely understood, and nurses have been worried about assessment, prevention and management of pressure ulcers (Mwebaza, et al.,2014). In spite of the fact that preventing pressure ulcers is considered multidisciplinary responsibility, nurses' role is of paramount importance (Samuriwo,2012; Nuru, et al.,2015). Nurses must intervene to prevent and treat PUs (Zuo, & Meng,2015). By applying some processes like risk evaluation, skin care, and mechanical loading, patient and staff education, could reduce PU development, and the literature indicates that by implementing these specific processes of pressure ulcer care will decrease the occurrence of ulcers (Cano, et al.,2015). Poor or improper knowledge and education have been introduced as the cause of high PUs prevalence rates (Zakrasek, Creasey, & Crew, 2015).

However, none of these studies investigated the ability of Iran cardiac surgery nurses' knowledge and practice related to PUs and effect on incidence of PUs in cardiac surgery patients (Baghaei, R. & Azar, 2016). The current study is the first of its kind in Iran, and provides an opportunity to evaluate Iran cardiac surgery nurses' knowledge and utilization of pressure ulcer prevention and treatment and the effect on PUs incidence. The main purpose of this study was to assess nursing knowledge and practices and the rate of pressure ulcer among patients undergoing cardiac surgery following a pressure ulcer educational program on pressure ulcer prevention and treatment at national and global levels. The findings of this study can form a baseline for nurses and health care professionals and may contribute to develop an educational platform.

Method

This quasi-experimental study design was conducted in the northwest Heart Hospital of Tabriz in Iran from March 1 to June 15 in 2015. The hospital is an exclusive heart specialty and educational center in the northwest of country. The setting for this study was consisted of two Cardiac Intensive Care Units 1&2 (CICUs).

The participants composed of voluntary 334 patients who undergone cardiac surgery and admitted CICU1 (intervention group) and CICU2 (control group) and 54 nurses who were working in CICUs and divided in two groups (intervention and control group), 27 from CICU1 and 27 from CICU2.

The sample size in this study was estimated using the mean and standard deviation of the similar studies and, also 10% due to the probability of dropping the samples, 27 in each group. The participants were selected by convenience sampling method and after explaining the purpose of study the informed consent was attained.

The inclusion criteria included registered nurses who had Bachelor degree or above, working at least six months in CICUs, volunteered to participate in the study, direct care of patients, and ages between 25 and 45. Exclusion criteria included reluctant to continue the study and incomplete completion of questionnaires.

The study tool consisted of three parts: “Nurses' demographic Form” (consisted of 12 items), “the Pieper Pressure Ulcer Knowledge Test” (47 items) and “Self-Assessment in Nursing Practices Form” (31 items) to measure knowledge and practices of nurses about pressure ulcers.

The PPUKT questionnaire was divided into three categories including: (1) ulcer classification/onset (6 items); (2) wound characteristics (8 items), and (3) preventive measure (31 items) (Pieper, et al., 1995) and evaluated by true, false and I don't know. The total score on the knowledge test was the sum of all correct answers. This test was translated from English into Farsi and validity and reliability of the test was carried out by Iranmanesh et al (2011). In this study, the alpha coefficient for questionnaire was 0.88.

The “Self-Assessment in Nursing Practices Form” was developed by researcher based on the literatures (Bangova, 2013; Arnold, 2003; Karen, et al., 2013) consisted of 31 items about nurses' practices and interventions preventive and curative care of pressure ulcers. Ratings were based on a four-point *Likert scale*. Scale points were worded as ‘Always’, ‘Sometimes’, ‘Seldom’, ‘Never’.

Minimum and maximum values for the overall of items were 33 and 132. The higher scores indicated an increased frequency of practice for prevention and management pressure ulcer. This form was answered by nurses' pre-education and post-education after one months. The Cronbach's alpha reliability coefficients of this study were found pre-test .675 and post-test .714.

The researcher distributed the data collections form to participants (n=54). Participants answered individually during work hours on day or night and returned the test to the researcher immediately in an unidentified plain white envelope. To guarantee the participant privacy, there was no information collection that could show their identities. The education program about pressure ulcer prevention and treatment provided for ICU1 nurses (intervention group ward, the nurses of control ward (ICU2) has not educated. The educational intervention consisted of two 120-minute lectures in which the EPUAP & NPUAP was performed and illustrated by a single researcher. The data were analyzed using SPSS version 20 and descriptive statistics and analyzed by independent t test, Chi-square test statistical tests in a significant 0.05.

This research is a section of the Ph.D. thesis and was conducted in compliance with principles of Helsinki Declaration. Approval was obtained from the Hacettepe University Non-Interventional Clinical Research Ethics Board (21.01.2015) and Ethical Committee in Tabriz, Iran (08.03.2015).

Result

The results of this study showed that 88/9% of nurses and 52.7% of patients were female, the mean age of nurses participating in the study was 34.3, and 61/4% of patients aged between 57 and 84. Also, there was no significant difference between the demographic characteristics of the nurses in the intervention and control groups according to Table 1 in terms of age, sex, level of education and training on PUs. Also, according to Table 2, there was no significant difference in age, BMI between demographic characteristics of both intervention and control groups except gender.

Table 1- Statistical analysis of nurses' socio-demographic characteristics according to groups (n=54)

Socio-demographic characteristics	Total		Intervention Group		Control Group		Statistic	
	Mean	SD	Mean	SD	Mean	SD	Z, t	p
Age	34.90	4.55	35.11	5.40	34.70	3.50	Z = -.061	.951
Work experience (years)	11.70	4.33	11.41	5.07	12.00	3.52	t = .499	.062
	n	(%)	n	(%)	n	(%)	χ^2	p
Gender								
Male	6	11.1	2	7.4	4	14.8	.750	.669
Female	48	88.9	25	92.6	23	85.2		
Age group (years)								
28-35	29	53.7	15	55.6	14	51.9	.074	1.000
36-50	25	46.3	12	44.4	13	48.1		
Educational level								
Bachelor	51	94.4	26	96.3	25	92.6	.353	1.000
Master	3	5.6	1	3.7	2	7.4		
Work experience (years)								
≤12	30	55.6	17	63.0	13	48.1	1.200	.412
≥13	24	44.4	10	37.0	14	51.9		

Training on PUs	10	18.5	6	22.2	4	14.8	.491	.728
Yes	44	81.5	21	77.8	23	85.2		
No								

Table2- Statistical analysis of patients' socio-demographic characteristics according to groups (n=334)

Socio-demographic characteristics	Total		Intervention Group		Control Group		Statistics	
	Mean	SD	Mean	SD	Mean	SD	t	p
Age	56.47	13.98	59.04	13.96	53.89	13.55	3.41	.113
BMI ¹	26.34	4.44	26.96	4.70	25.71	4.08	2.58	.90
Age group (years)	n	(%)	n	(%)	n	(%)	X²	p
20-56	129	38.6	57	34.1	72	43.1	2.842	.115
57-84	205	61.4	110	65.9	95	56.9		
BMI¹							13.724	.001
Underweight + Normal ²	141	42.2	62	37.1	79	47.3		
Overweight	126	37.7	58	34.7	68	40.7		
Obese	67	20.1	47	28.2	20	12.0		
Gender							8.119	.006
Male	158	47.3	66	39.5	92	55.1		
Female	176	52.7	101	60.5	75	44.9		
Marital status							.524	.588
Married	300	89.8	152	91.0	148	88.6		
Single + Divorced + Widow	34	10.2	15	9.0	19	11.4		

¹BMI = Body Mass Index² There were 7 patients in the underweight group.

Table 3- statistical analysis of pressure ulcer Risk factors related to preoperative and postoperative phases according to groups (n=334)

Characteristics	Total		Intervention Group		Control Group		Statistics	
	n	(%)	n	(%)	n	(%)	X ²	p
Preoperative phase								
Comorbidity							12.995	.002
DM ¹	165	49.4	68	40.7	97	58.1		
Others	88	26.3	46	27.5	42	25.1		
Absent	81	24.3	53	31.7	28	16.8		
Intraoperative phase								
Type of surgery							9.837	.002
CABG ²	223	66.8	125	74.9	98	58.7		
Others ³	11	33.2	42	25.1	69	41.3		
Type of operation							.101	.874
On-Pump	288	86.2	143	85.6	145	86.8		
Off-Pump	46	13.8	24	14.4	22	13.2		
Hypothermia							.101	.874
Yes	288	86.2	143	85.6	145	86.8		
No	46	13.8	24	14.4	22	13.2		
Vasopressors							2.21	.193
Yes	32	9.6	12	7.2	32	9.6		
No	302	90.4	155	92.8	302	90.4		
Preoperative phase								
	Mean	SD	Mean	SD	Mean	SD	t	p
Length of hospital stay (days)	8.11	7.72	7.95	6.85	8.24	8.52	-3.18	.330

Ejection Fraction %	41.12	6.50	41.13	6.22	41.10	6.79	.042	.483
Intraoperative phase								
Duration of general surgery	4.10	1.11	3.89	1.00	4.31	1.17	-3.511	.225
Duration of general anesthesia	5.08	1.10	4.92	1.02	5.24	1.16	-2.620	.674
Hypothermia duration (hours) (n=288)	1.42	0.77	1.3	0.90	1.49	0.62	-1.583	.271

¹Diabetes Mellitus

²Coronary Artery Bypass Graft

Table 4- Risk factors related to postoperative phases (ICU) according to groups (n=334)

Characteristics	Total		Intervention Group		Control Group		Statistics	
	N	(%)	n	(%)	n	(%)	X ²	p
Vasopressors								
Yes	69	20.7	34	20.4	35	21.0	.018	1.00
No	265	79.3	133	79.6	132	79.0		
Sedatives								
Yes	197	59.0	98	58.7	99	59.3	.012	1.00
No	137	41.0	69	41.3	68	40.7		
Narcotics								
Yes	258	77.2	129	77.2	129	77.2	.000	1.00
No	76	22.8	38	22.8	38	22.8		
Restraint								
Yes	162	48.5	93	55.7	69	41.3	6.904	.012
No	172	51.5	74	44.3	98	58.7		
GCS								
3-8	16	4.8	9	5.4	7	4.2	8.363	.039
9-12	54	16.2	35	21.0	19	11.4		
13-14	17	5.1	5	3.0	12	7.2		
15	247	74.0	118	70.7	129	77.2		
C-Reactive Protein								
Negative	184	55.1	85	50.9	99	59.3	22.051	.000
+ (<1 mg/L)	25	7.5	16	9.6	9	5.4		
++ (1-3 mg/L)	61	18.3	34	20.4	27	16.2		
+++ (>3 mg/L)	35	10.5	26	15.6	9	5.4		
++++ (>10 mg/L)	29	8.7	6	3.6	23	13.8		
Systole	110.53	24.55	107.69	22.51	113.37	26.02	-2.124	.026
Diastole	63.10	15.32	61.62	13.39	64.58	16.95	-1.773	.061
Mechanical Ventilation	15.55	20.24	17.07	21.46	14.02	18.89	1.378	.292
GCS	13.74	2.43	13.53	2.54	13.95	2.30	-1.577	.008
Laboratory results								
Lymphocyte	3.28	4.26	3.39	4.11	3.18	4.41	0.457	.566
Haemoglobin	10.44	1.61	10.60	1.79	10.28	1.40	1.117	.117
Creatinine	1.09	0.49	1.02	0.23	1.16	0.65	-2.59	.010
Blood Glucose	154.82	46.76	150.40	47.15	159.23	46.09	-1.730	.809
Length of ICU stay (days after operation)								
	4.57	5.38	3.89	2.17	5.25	7.24	-2.321	.000

Table 5- comparison level of pretest and posttest knowledge scores according to groups

	Level Knowledge Score
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Groups	Pre-test			p ¹	Post-test			p ¹
	Low	Moderate	High		Low	Moderate	High	
	n (%)	n (%)	n (%)		n (%)	n (%)	n (%)	
Intervention	6 (22.2)	21 (77.8)	-	.728	-	-	27(100)	.000
Control	4 (14.8)	23 (85.2)	-		4(14.8)	23(85.2)	-	

¹Pearson Chi Square

The results of Table 5 showed that there is not a significant difference between the scores of nurses' knowledge of intervention and control groups in the pre-test, but there is a significant difference between the two groups in post-measure scores.

Table 6- Level of correct answer scores for pre-test and post-test questions regarding the prevention and management of pressure ulcers in the self-assessment test

Groups	Level of Correct Answer Scores							
	Pre-test				Post-test			
	Min-Max	Mean	SD	t, p	Min-Max	Mean	SD	t, p
Intervention	72-100	93.96	7.12	-0.115	100-112	107.25	3.84	-.8.606
Control	73-102	93.74	7.74	1.000	72-103	93.66	7.24	0.008

According to table 6, there is not a significant difference between the practice scores nurses' in intervention and control groups in the pre-test. But, there was a statistically significant difference between the post-test mean practice scores of the intervention and control groups ($p=.008$).

Discussion

The findings of this study showed that the incidence of PUs in the control group was 9/5%, While the findings of the Fife et al, (2001), Ahmadinejad and Rafiei (2010), and Akbari Sari et al.'s (2014) studies showed that the incidence of PUs were 12/4, 5/34, and 27%, as well as (34,35,21), the findings of the systematic review of Krupp (2015) indicated that the incidence of PUs in hospitalized patients in ICUs ranged from 8.8 to 23% (36). It seems that the reason for this difference in the incidence of PUs in different studies is use of different grading systems for diagnosis and grading of pressure ulcers, different methods of data collection about pressure ulcer, different (or lack of) population characteristics, unreported preventive measures, and the use of different inclusion and exclusion criteria in different studies.

Findings about nurses' knowledge about PUs, treatments and preventive measures in this study showed that the level of knowledge of nurses was low to moderate level and the highest score was for PUs classification and onset domains. These findings are consistent with the findings of Pancorbo-Hidaglo et al. (2007), Panagiotopoulou and Kerr (2002) and Moore and Price's (2004) studies, on the acceptability of nurses' knowledge of treatments and preventive measures (Pancorbo-Hidaglo, et al.,2007; Panagiotopoulou, Kerr,2002; Moore, Price,2004). Also, findings from studies in Belgian nurses showed that having a positive attitude towards PUs prevention of pressure ulcer is an important indicator in the prevention of PUs. This was also confirmed in this study and encouraged nurses to Prevention and treatment of PUs are more eager to learn, and even confirm that Irish nurses who knew that lack of awareness was one of the main barriers to preventing and treating (Beeckman, et al., 2011), so that after the short training courses, the incidence of wound healing was reduced (Beeckman, et al., 2011). Also the finding of Iranmanesh study showed that the level of knowledge of Iranian orthopedic nurses in the field of PUs is consistent with our findings, which indicates that Iranian nurses need more training in the prevention and treatment of Pus (Iranmanesh, et al.,2013). The findings of this study showed that short-term education has an increasing effect on the level of knowledge and practice of nurses that is consistent with the findings of Fernandez et al (2008) and Zulkowski et al. (2007). Their studies also showed that short-term education on nurses' knowledge of prevention and treatment PUs has an uplifting effect. Their study also found that short-term training on prophylactic and therapeutic methods would be a major contributor to migraine, and prompting the recapitulation of information in the short term and in the long run would increase the incentive for more studies in individuals (Fernandes, et al.,2008; Zulkowski, et al.,2007). The findings of this study also showed that although the performance of nurses was at first moderate level, they were short lived after high education, while most studies in Iran showed that the level of nurses' performance in Iran was unacceptable And most of them do not follow functional preventive and therapeutic guidelines, which can be attributed to the effects of nursing education enhancement.

Similar studies also confirmed that short-term training had beneficial effects on the level of nurses' performance in the treatment and prevention of wound healing - this effect was determined by the incidence of bed sores in patients, which is compatible with studying the group that learning can empower nurses.

Considering the fact that the level of awareness of nurses in the special department of cardiology is low in this study, and also considering that the findings showed that short-term training program for nurses could increase their awareness in prevention and treatment of substitutional wound and It can be concluded that the short-term training program is effective and can be used to increase awareness and performance.

Conclusion and suggestions

According to the results of this study, the short-term training program can increase the level of knowledge about PUs and performance of the nurses in the CICU. Therefore, the elaboration of these programs for nurses in CICUs can reduce the incidence of PUs in patients, as well as reduce mortality, disability and costs. Also, for future studies, it is suggested that this study be carried out for patients and other specialized departments, another study should be conducted in a randomized clinical trial.

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