ORIGINAL ARTICLE

The Effect of Training the Nonverbal Pain Scale (NVPS) on the Ability of Nurses to Monitor the Pain of Patients in the Intensive Care Unit

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Abstract

Introduction: Pain in the intensive care unit is a silent fact. Considering the positive features of the nonverbal pain scale (NVPS) in assessing the pain of non-verbal patients, this study investigates the effect of training the NVPS on the ability of nurses to monitor the pain of patients in the intensive care unit.

Materials and methods: In this semi-experimental study, the effect of the NVPS training on the ability of 50 intensive care unit (ICU) nurses of Imam Khomeini Hospital affiliated to Ahvaz University of Medical Sciences was investigated. At first, the ability to diagnose the presence and intensity of pain was checked by a checklist. Then the nurses were taught how to use the scale correctly. After 2 weeks of training completion, the ability to correctly use the scale was measured again. Data analysis was performed using descriptive statistics (mean and standard deviation) and inferential statistics (McNemar, Chi-squared, paired *t*-test, and Fisher's exact test) in SPSS software version 16.

Results: After the training on the non-verbal pain scale, there was a significant difference between the intervention and control groups in diagnosing the presence of pain related to changing the patient's position ($p = 0.023$). Also, nurses ability to diagnose pain intensity during airway suction increased fourfold and for physiotherapy procedures twice as much as before training.

Conclusion: Nonverbal pain scale training improves ICU nurses ability in diagnosing the presence and severity of pain in nonverbal patients.

Keywords: Intensive care unit, Nonverbal pain scale, Nursing, Pain monitoring.

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Highlight

This study shows that tools such as NVPS can empower nurse's performance in monitoring the pain of ICU patients.

Introduction

Pain is the fifth vital sign and an unpleasant mental experience related to actual or possible tissue damage.[1] Studies show that 45 to 85% of ICU patients experience pain due to airway suctioning, change of position, and prolonged immobility.[1,2] Pain in ICU patient's is a silent fact. The neglect of nurses to examine and manage the pain of these patients is due to sedation, poor physiological condition, and the patient's inability to verbally communicate due to intubation.[1,3] Failure to diagnose pain can lead to severe stress, increased cardiac oxygen consumption, tachycardia, altered lung mechanics, water and sodium retention, organ damage, worsening of complications, increasing length of stay (LOS) in ICU, and even death.[3,4] Research shows that ICU nurses find pain assessment challenging when patients are unable to express their pain.[5] Therefore, recognizing pain helps to better control pain, reduce patient suffering, and reduce complications and death.[6]

Various tools have been proposed to measure pain in non-verbal critically ill patients including NVPS, BPS (Behavioral Pain Scale), CPOT (Critical-Care Pain Observation Tool), and FLACC (Face, Legs, Activity, Cry, Consolability).[5,7] It has been found that ICU nurses do not find the FLACC scale satisfactory for critically ill adult patients, because this scale is more related to measuring crying behaviors in infants and children.[6] The BPS and care pain observation tool (CPOT) scales focus only on behavioral observations (facial expressions, crying, and movements). Nonverbal pain scale is a combination of behavioral and physiological measurements and provides a more reliable assessment of pain in ICU patients.[4] Chookalayi et al. showed NVPS has acceptable psychometric properties for pain assessment in ICU patients who have no verbal communication.[8] Based on the above information, the cornerstone of pain management is accurate pain assessment methods, especially in nonverbal critically ill patients. Lack of training for nurses to use these tools often leads to pain assessment and intervention in a tasteful way.[9] Studies have been conducted on the effects of CPOT and BPS training on nurse's ability to diagnose and manage pain in patients admitted to intensive care units.[10,11] However, there is insufficient information on the ability of intensive care unit nurses to diagnose pain after training in NVPS. Therefore, researchers have investigated the effect

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of NVPS scale training on the ability of nurses to monitor the pain of patients hospitalized in the ICU.

Materials and Methods

A semi-experimental study was conducted on ICU nurses of Imam Khomeini Hospital affiliated to Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. The inclusion criteria were a bachelor's degree in nursing and above, at least 6 months of working experience in the ICU, and not having completed training courses in using pain assessment tools. Pain monitoring was implemented on intubated adult patients (over 18 years old) who were hospitalized in the intensive care unit. Patients under the prescription of sedatives in the form of infusion (for ventilator withdrawal, etc.,) or with a history of drug addiction were not included in the study. According to the Altman nomogram, and a power of 80% and a maximum standard error of 0.79, the total number of required samples was calculated as 50.[10] First, a list of nurses was prepared from two internal ICUs and two surgical ICUs. Then, the samples were assigned to intervention and control groups by block size 4 (website: https://www.sealedenvelope.com/simple-randomiser/v1/lists). The data collection instrument included a demographic data sheet (age, gender, marital status, clinical work experience, ICU work experience, level of education) and a modified checklist to assess the ability of nurses to pain monitoring (diagnosing the presence of pain and its intensity). The checklist used in this research was taken from the study of Sedighi et al. and Saltanian et al. which referred to pain monitoring during nociceptive procedures (positioning and airway suctioning).[11,12] According to the clinical experiences of the research team and literature, several other painful procedures including venous/arterial blood sampling, mouth care, eye care, NGT placement, and physiotherapy (such as moving the joint in the range of motion) were added to the checklist. To determine the qualitative content validity, 10 experts in intensive care and in the psychometrics of the instruments were asked to give their views on grammar, using appropriate and correct words, applying correct and proper order of words in items, and appropriate scoring. According to the modified Lawshe table, CVR >0.62 was recognized as the criterion for essential items in the tool. The presence and intensity of pain in the state without painful procedures, during the placement of the nasogastric tube (NGT), and during eye care scored less than 0.62 and were excluded. To check content validity index (CVI), Waltz, and Basel reliability index was used. The index of relevance was; very relevant = 4, relevant = 3, somewhat requiring revision = 2, irrelevant = 1. The items that scored 3 and 4 were included in the CVI calculation formula, and the criteria for accepting the items were as follows: CVI above 0.79 is appropriate, CVI between 0.70 and 0.79 should be revised, and CVI <0.70 was unacceptable. In this regard, no item scored less than 0.7. After the finalization of the checklist, a modified checklist was presented, the items of which were divided into two categories: (a) The ability of nurses to recognize the presence or absence of pain during painful procedures, (b) The ability of nurses to recognize the intensity of pain. The way of scoring the items of nurse's ability to recognize the intensity of pain was on a Likert scale from 0 to 10, which was classified as no pain (0), mild (1–3), moderate (4–6), and severe (7–10). The way of scoring the items of nurses' ability to recognize the presence of pain was as yes (1) and no (0) answers. Before teaching the NVPS scale, the ability of nurses to recognize the presence and intensity of pain during specified painful procedures were evaluated using a checklist. The NVPS scale was taught to the intervention group through a 2-hours lecture and at the end of the session, an educational pamphlet was provided to the participants. The training took place in the hospital amphitheater while maintaining social distance in the conditions of COVID-19. At the end of the training session, the researcher sent the educational pamphlet on the use of NVPS to the nurses through WhatsApp or e-mail. After 2 weeks of NVPS training, the checklist was completed again. To determine the presence and severity of pain, nurses were asked to record their assessment in the checklist. Also, the researcher (the first author of the article) separately recorded his assessment of the presence and intensity of the patient's pain as a criterion for comparison with the nurse's assessment. If the nurse's score was different from the researcher's score, it was considered zero (false) and 1 (true) in the same scoring. Scoring of pain intensity was considered as the absence of pain (0), mild (1–3), moderate (4–6), and severe (6–10).

Table 1: Demographic characteristics of nurses

Variable	*Control (n = 25)* N (%)	*Intervention (n = 25)* N (%)	*p-value*
Gender			
Male	2 (8)	5 (20)	0.417
Female	23 (92)	20 (80)	
Marital status			
Single	18 (72)	16 (64)	0.762
Married	7 (28)	9 (36)	
Level of education			
BSN	25 (100)	22 (88)	0.235
MSN	0	3 (12)	
Employment status			
Contractual	20 (86.9)	16 (69.6)	
Official	2 (8.7)	6 (26.1)	0.414
Compulsory medical service program	1 (4.3)	1 (4.3)	
Age (years): mean ± SD		30.64 ± 5.66	
Work experience in ICU (years): mean ± SD		3.62 ± 3.19	

Ethical Considerations

The code of ethics was obtained from Shahed University Ethics Committee. Also, the study was conducted in coordination with the Imam Khomeini Hospital in Ahvaz. After obtaining written informed consent, all participants were assured of the confidentiality of their information. Nurses were informed of voluntary participation in the research and they could freely withdraw at any stage of the study. Data descriptive statistics (mean, standard deviation, and frequency), and inferential statistics (McNemar, Chi-squared, paired *t*-test, and Fisher's exact test) were used in Statistical Package for the Social Sciences (SPSS) (ver. 16).

Results

There was no significant difference in any of the demographic characteristics of the two groups ($p < 0.05$) (Table 1). After NVPS training there was a significant difference in the correct diagnosis of the presence of pain between the two groups in the procedure

of positioning (= 0.023). There was not a significant increase in the correct response to the presence of pain in the intervention group after and before training on NVPS (98% vs 88%). After NVPS training in the intervention group, there was an increase in the correct responses to the intensity of pain during positioning ($p = 0.001$). There was a significant difference in the correct diagnosis of pain intensity between the two groups after the intervention ($p < 0.001$). The control and the intervention groups were similar to the correct diagnosis of the presence of pain in airway suctioning before and after the training. Also, after NVPS training, 88% of the nurses in the intervention group correctly diagnosed the intensity of the patient's pain compared to before (20%) the intervention ($p < 0.001$). There was a significant difference in the frequency of correct responses to pain intensity during airway suction between the intervention and control groups after NVPS training ($p < 0.001$). The frequency of correct response to the presence of pain during vascular procedures (blood drawing or venipuncture) was not significantly increased after NVPS training in the intervention group compared to before training. Also, finding did not show a significant difference between the two groups in the correct diagnosis of pain intensity during vascular procedures in the post-intervention phase. The results did not show a significant difference in the correct response to pain during oral care in the intervention group after NVPS training. Also, after the training, there was no significant difference between the two groups in the correct response to the diagnosis of pain intensity. In examining the correct response to pain while physiotherapy, all nurses were able to diagnose pain both before and after NVPS training. Regarding the correct diagnosis of pain intensity, while performing movements in the joint or physiotherapy, there was an increase in the correct response in the intervention group and a significant difference in the correct diagnosis of pain between the control and intervention groups after NVPS training ($p < 0.001$) (Table 2). The results showed a significant reduction in the average response difference between the nurse and the researcher to the intensity of pain in the procedures of positioning ($p < 0.001$), airway suction ($p < 0.001$), blood drawing or venipuncture ($p = 0.039$), oral care ($p = 0.021$) and moving joint or physiotherapy ($p = 0.002$) in the post-training phase ($p < 0.001$) (Table 3).

Discussion

Some studies show in ICU patients, CPOT and BPS have acceptable validity in differentiating non-nociceptive and nociceptive procedures.[13] However in this study, the implication of NVPS was investigated in ICU patients.

The results show a similar scoring of trained nurses with the researcher on pain during positioning. In line with this finding, Sedighi et al. showed that after training on the BPS, the ability of ICU nurses to recognize the presence of pain in the procedure of changing position increases from 58% to more than 76%.[11] Also, Asadi-Noghabi et al. show less than half of the nurses had relatively favorable scores before the intervention of training the CPOT for patients with a decreased level of consciousness, while more than half of the nurses have better pain diagnosis conditions after the intervention.[10]

Regarding the diagnosis of pain intensity in the suction procedure, the findings indicate that after the NVPS training, nurses are four times more able to correctly diagnose the pain intensity. Similarly, Sedighi et al. showed after the intervention, nurses report moderate to severe patient pain during suction.[11] Also, Soltanian et al. showed nurses can diagnose the severity of pain up to 80% after the BPS training.[12] Contrary to the findings of the present study, in the Akhond study, after providing NVPS training, the nurses were asked to identify, measure, and manage the pain for three months in the patients hospitalized in the surgical ICU.[14]

In the present study, due to having both physiological and behavioral criteria, NVPS training provides optimal and more confidence for the correct diagnosis of pain in non-verbal patients. In the importance of this issue, the longitudinal study of Robleda et al. shows vital signs are not specific to pain and can be influenced by vasopressors, beta-blockers, antiarrhythmic agents, or underlying diseases such as *sepsis*.[15] Another finding is that 96% of untrained nurses find venipuncture and blood sampling painful in ICU patients. However, nurse's ability to diagnose pain intensity increases slightly after training. Bray et al. concluded that in the neurology ICU, the low pain intensity score is probably due to the decrease in verbal communication and relaxation of facial and body posture related to the use of continuous intravenous sedation for seizure management, coordination with the ventilator, or the inadequacy of the NPAT for pain assessment.[16] While in this study, patients who were treated with sedatives or continuous infusion of sedatives 6-hours before the painful procedure were not included. Also, the NVPS scale has both physiological and behavioral parameters for pain evaluation, which increases the accuracy of pain monitoring.

Dale et al. show patients admitted to an intensive care unit have experienced pain in oral procedures.[17] It has even been determined that clinicians often consider the pain related to mouth care on critically ill patients as too transient or not painful at all.[18] The findings of this study indicate that there is no significant change in the correct diagnosis of the presence of pain during oral care after NVPS training. This is probably due to the nurses' understanding and experience of the painfulness of oral care in ICU patients. This finding is probably attributed to more close facial changes while nurses performing oral care. Another finding is that all nurses can diagnose the presence of pain during physiotherapy and the correct answer to the intensity of pain increases twice. A possible reason is that NVPS emphasizes the physiological parameters of pain during the patient's physiotherapy.[19]

Authors acknowledge this limitation of the probably false positive findings due to not adjusting *p*-values in multiple comparisons between groups.

Conclusion

Training the non-verbal pain scale is effective on nurses' performance in pain monitoring in painful procedures. By reflecting on the results, it can be concluded that NVPS can sensitize nurses to the pain of intubated patients and improve their performance in pain monitoring as the starting point of pain management. It is suggested to study the effect of video training of NVPS on nurses' performance in pain monitoring of non-verbal patients admitted to the intensive care unit.

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Table 2: The frequency of correct response to the presence and intensity of pain in painful procedures before and after the training of NVPS ($n = 50$)

Pain diagnosis	*Stage*	*Response*	*Intervention (n = 25)*	*Control (n = 25*	*p-value**	*Pain diagnosis*	*Stage*	*Response*	*Intervention (n = 25)*	*Control (n = 25)*	*p-value**
Diagnosis of pain (change position)	Before	False	3 (12)	8 (32)	0.171	Diagnosing the presence of pain (blood drawing/ venipuncture)	Before	False	5 (20)	1 (4)	0.189
		True	22 (88)	17 (68)				True	20 (80)	24 (96)	
	After	False	1 (4)	8 (32)	0.023		After	False	1 (4)	1 (4)	1
		True	24 (96)	17 (68)				True	24 (96)	24 (96)	
	p-value**		0.50	1			*p*-value**		0.125	1	1
Diagnosis of pain intensity (change position)	Before	False	17 (68)	21 (84)	0.321	Diagnosing the intensity of pain (blood drawing/ venipuncture)	Before	False	14 (56)	13 (52)	
		True	8 (32)	4 (16)				True	11 (44)	12 (48)	0.085
	After	False	4 (16)	24 (96)	<0.001		After	False	7 (28)	14 (56)	
		True	21 (84)	1 (4)				True	18 (72)	11 (44)	
	p-value**		0.001	0.250			*p*-value**		0.092	1	
Diagnosis of pain (airway suctioning)	Before	False	1 (4)	0	1	Diagnosing the presence of pain oral care)	Before	False	1 (4)	4 (16)	0.349
		True	24 (96)	25 (100)				True	24 (96)	21 (84)	
	After	False	0	0	–		After	False	1 (4)	2 (8)	1
		True	25 (100)	25 (100)				True	24 (96)	23 (92)	
	p-value**		–	–			*p*-value**		1	0.625	
Diagnosis of pain intensity (airway suctioning)	Before	False	1 (4)	0	1	Diagnosing the intensity of pain (oral care)	Before	False	15 (60)	14 (56)	1
		True	24 (96)	25 (100)				True	10 (40)	11 (44)	
	After	False	0	0	–		After	False	(7 (28	18 (72)	0.004
		True	25 (100)	25 (100)				True	18 (72)	7 (28)	
	p-value**		–	–			*p*-value**		0.039	0.424	
Diagnosing the presence of pain while performing movements in the range of motion of the joints/ physiotherapy	Before	False	0	0	–	Diagnosing the presence of pain while performing movements in the range of motion of the joints/ physiotherapy	Before	False	14 (56)	16 (64)	0.773
		True	25 (100)	25 (100)				True	11 (44)	9 (36)	
	After	False	0	0	–		After	False	3 (12)	16 (64)	<0.001
		True	25 (100)	25 (100)				True	22 (88)	9 (36)	
	p-value**		–	–			*p*-value**		0.003	1	

**Mc Nemar test, Fisher's exact test

Table 3: The average difference in response to pain intensity between the researcher and the nurse before and after the training of NVPS ($n = 50$)

		Intervention (n = 25)	*Control (n = 25)*		
Procedure	*Stage*	*Mean ± SD*	*Mean ± SD*	*95% CI*	*p-value**
Change position	Before	0.8 ± 0.64	1.16 ± 0.68	−0.006–0.726	0.062
	After	0.16 ± 0.37	1.28 ± 0.54	0.863–1.37	<0.001
	p-value**	<0.001	0.376	–	–
Airway suctioning	Before	0.84 ± 0.47	0.84 ± 0.62	−0.305–0.305	0.925
	After	0.12 ± 0.33	0.76 ± 0.59	0.375–0.905	<0.001
	p-value**	<0.001	0.480	–	–
Blood drawing/venipuncture	Before	0.64 ± 0.63	0.68 ± 0.74	−0.341–0.421	0.84
	After	0.28 ± 0.45	0.6 ± 0.57	0.035–0.605	0.035
	p-value**	0.039	0.527	–	–
Oral care	Before	0.6 ± 0.5	0.68 ± 0.69	−0.254–0.414	0.827
	After	0.28 ± 0.45	0.8 ± 0.57	0.235–0.805	<0.001
	p-value**	0.021	0.518	–	–
Movements in the range of motion of the joints/physiotherapy	Before	0.56 ± 0.50	0.76 ± 0.66	−0.125–0.525	0.312
	After	0.12 ± 0.33	0.6 ± 0.5	0.245–0.715	<0.001
	p-value**	0.002	0.206	–	–

*Mann-Whitney test, **Wilcoxon signed ranks test

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