



Toseef M RN<sup>1</sup>, Joshi P RN<sup>2\*</sup> and Sinha S<sup>3</sup>

<sup>1</sup>Nursing Officer, Department of Cardiology and Cardiothoracic Sciences Centre, India

<sup>2</sup>Lecturer, College of Nursing, All India Institute of Medical Sciences, New Delhi, India

<sup>3</sup>Professor, Department of Neurosurgery, India

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**\*Corresponding author:** Poonam Joshi, Doctor, Lecturer, College of Nursing, All India Institute of Medical Sciences, New Delhi, India, Tel: +91-11-2659 4457; Fax: +91-11- 2658 8663; 2658 8641; E-mail: pjoshi495@gmail.com

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## Research Article

# A Pre-Experimental Study to Evaluate the Effect of ICU Prophylaxis Program in Improving the Knowledge, Practices Related to Pressure Ulcers and Deep Vein Thrombosis in Spinal Cord Injury Patients and its Acceptability by the Nurses in a Tertiary Care Facility

## Abstract

Good nursing care is a key factor in reducing the most common complications related to immobility like pressure ulcers (PU), deep vein thrombosis (DVT) in spinal cord injury (SCI) patients.

**Materials and methods:** The study was conducted using a pre-experimental, time series design on 52 nurses and 73 patients with SCI (30 before and 43 after the intervention) enrolled by universal sampling technique in a trauma ICU of a tertiary care facility to evaluate the effectiveness of ICU Prophylaxis Programme (IPP) in terms of knowledge, practices related to PU and DVT in SCI patients and its acceptability by the nurses. Pretested and validated tools were used to collect the data. Occurrence of the PU and DVT were assessed among the admitted SCI patients during the study period as secondary outcome.

**Results:** There was significant improvement in knowledge scores of nurses (in post-test 1) following the implementation of IPP in PU ( $12.87 \pm 2.37$  vs.  $16.23 \pm 1.60$ ,  $p < 0.001$ ) and DVT ( $12.90 \pm 2.30$  vs.  $17.08 \pm 1.49$ ,  $p < 0.001$ ), however slight reduction in knowledge scores was observed on 15<sup>th</sup> day (post -test 2) in PU ( $15.77 \pm 1.88$ ,  $p \geq 0.269$ ) and DVT ( $16.29 \pm 1.80$ ,  $p \geq 0.219$ ) as compared to post-test 1. There was also significant improvement in practice scores of nurses following the implementation of IPP in PU ( $6.23 \pm 1.57$  vs.  $8.44 \pm 1.046$ ,  $p < 0.001$ ) and in DVT ( $1.55 \pm 1.17$  vs.  $8.21 \pm 1.28$ ,  $p < 0.001$ ) on 15<sup>th</sup> day. Majority of nurses (84.6%) expressed moderate acceptability towards the IPP. The occurrence of the PU reduced from 16.6% to 4.6% after IPP and the use of mechanical prophylaxis for the prevention of DVT increased.

**Conclusion:** IPP improved the knowledge and practice scores of the nurses in PU and DVT and reduced the occurrence of PU among SCI patients and increased the use of mechanical prophylaxis for prevention of DVT among admitted SCI patients.

## Introduction

Spinal cord injuries (SCI) are the most common injuries seen after head injury in motor vehicle accidents, gunshot injuries and fall. These injuries are likely to make patients incapacitated and hospitalized for a long time. During the course of their stay in Trauma Intensive Care Unit (TICU), these patients are likely to develop two complications related to immobility namely Pressure Ulcers (PU) and Deep Vein Thrombosis (DVT).

TICU is a specialty unit equipped with trained staff and gadgets for monitoring, treatment of patients with life threatening injuries and complications arising secondary to those injuries, which are reversible. It provides expert treatment facilities for the support of vital function and utilizes the skill of medical, and nursing personnel experienced in the management of these problems. Among the health care team members, nurses play a key role in providing care to the patients admitted in hospital with SCI. Meticulous nursing

care, continuous monitoring and vigilant observation on the part of nurses can make significant contribution in acute care, early recovery and rehabilitation of patients with SCI.

Care related to prevention of PU and DVT in SCI patients come under the preview of nurses. Good nursing care including regular risk assessment, preventive measures and management of PU and DVT reduces the hospital stay of the patients and the financial constraint arising due to prolonged hospitalization. There are many valid tools available for high risk factors and severity of PU and DVT, but not in use in our TICU. It was observed that nurses while providing care to the patients with SCI practiced all nursing measures to prevent PU by frequently changing their position, providing water or air mattress and giving frequent back care. Similarly to prevent DVT, patients with SCI were provided with compression stockings or venous foot pumps without any risk assessment. No written protocols or monitoring charts existed in our TICU related to risk assessment, prevention, management and documentation of PU and DVT. A comprehensive ICU Prophylaxis Programme (IPP) was developed with a view to train the nurses working in our TICU regarding regular risk assessment, preventive measures and management of PU and DVT.

Some available research studies suggested the efficacy of the clinical educational programme and workshops [1-3], in enhancing the knowledge and practices of nurses and reduced the occurrence of PU and DVT among trauma patients, thus improved the outcome of critically ill patients [4-9]. Therefore the present study was conceptualized to evaluate the effectiveness of IPP in terms of knowledge, practices, and acceptability of the nurses and occurrence of PU and DVT among patients with SCI.

## Methodology

In a pre-experimental (one group pre-test post-test), time series design, effectiveness of IPP was assessed among 52 nurses in terms of knowledge scores before, immediately after and on 15th day following the IPP. Practice scores of the nurses were assessed as baseline and on 15th day following the intervention. Acceptability of IPP by nurses was assessed at the end of the programme. As secondary outcome, development and severity of PU and DVT was assessed in patients with SCI.

Ethical clearance was obtained from the institute ethics committee. Written informed consent was taken from the nurses and the relatives of the patients with SCI admitted in TICU after ensuring them about the confidentiality of the obtained information. Total seventy three patients with SCI [30 before (group I) and 43 after (group II) IPP], having age more than 18 years, hemo-dynamically stable and having stay in ICU for more than 48 hours were included. Patients with SCI with poly-trauma were excluded. Total 52 available nurses during the study were enrolled using universal sampling technique.

Data was collected using 5 pre-tested and validated tools namely tool 1 related to the demographic characteristics of nurses and patients with SCI, tool 2 - a Knowledge questionnaire related to PU and DVT (9 MCQs and 10 Yes/No type items each,

maximum and minimum possible score of 0-19), tool 3- an observation checklist to assess the practices of the nurses related to PU and DVT (10 items each, possible minimum and maximum scores were 0 - 10), tool 4 - IPP, a structured teaching programme included a monitoring chart to give an overview to the nurses working in TICU on risk assessment, prevention, management and documentation related PU and DVT in patients with SCI and tool 5 consisted of IPP acceptability Performa (5 items) that measured the acceptability of IPP by nurses on 5 point Likert scale. The responses in tool 5 were graded as *Strongly agree* (5), *Agree* (4), *Uncertain* (3), *Disagree* (2) and *Strongly disagree* (1) with a possible minimum and maximum score of 5 and 25. The acceptability scores were categorized as highly acceptable = 25-21, moderately acceptable = 20-15 and less acceptable = below 14. The project was piloted in a selected neuro-surgical ICU of the same tertiary care facility.

The IPP was conducted in small groups (2-3 nurses) in 25-30 minutes time. All the nurses were trained with IPP to do the risk assessment observe preventive measures for PU and DVT and to manage them using power point presentation and monitoring chart. The monitoring chart included the combined assessment of patients with SCI for risk factors like age, weight, BMI, co-morbid illness, surgical intervention, assigning risk score to the patient, monitoring and carrying out the interventions (based on available PU and DVT criteria scales). All the doubts related to the IPP were cleared and they were helped by the researcher in completing the assessment of patients with SCI as practice.

Demographic profile of the nurse and SCI patients, and baseline knowledge of nurses related to PU and DVT were collected in one month time in all three shifts. The practices of the nurses were assessed using observation checklist directly on the admitted SCI patients on the basis of care being given to patients. At the same time occurrence of PU and DVT was checked in 30 admitted patients with SCI. Soon after the IPP, post test 1 was carried out to find out the immediate gain in knowledge scores of the nurses related to PU and DVT. All the nurses who had undergone IPP were requested to continue practicing the programme. Reinforcement was done by providing direct supervision by the researcher and the Assistant Nursing Superintendent (ANS) in-charge of the unit. The post test 2 consisted of assessment of knowledge and practice scores of the nurses related to PU and DVT, conducted on 15<sup>th</sup> day following the IPP. The researcher took two month time to complete all subjects' post IPP assessment. Occurrence of PU and DVT in admitted patients with SCI was checked for one month after the completion of the programme. Acceptability of IPP by the nurses was assessed at the end of study.

## Data analysis

All the data were coded and entered in the Microsoft excel 2013 and all the entries were checked for any errors. SPSS 16 and STATA 12.1 were used for statistical analysis. Data were analysed using descriptive and inferential statistics. Descriptive statistics used were frequencies, percentage, mean, standard deviation and range and inferential statistics included were Chi-square test, Fisher exact test, Paired t test, Repeat

measures ANOVA and Mann Whitney U-test. The p-value of <0.05 was taken as statistically significant.

## Results

The mean age of the participants (years) was 28.82 ± 3.62 with range of 22–37. Majority of the nurses (69%) were females, belonged to Hindu religion (54%), having 10+2 as basic qualifications (95%). Most the nurses (61%) were having B.Sc. Nursing as their professional qualification. Mean working experience of the nurses (years) in ICU was 4.03 ± 3.03 and the mean total working experience was 5.98 ± 3.79. Majority of them did not attend in-service programme related to the PU (75%) and DVT (87%) (Table 1).

There were 30 patients (Group I) with SCI admitted in TICU before and 43 patients (Group II) after the IPP. The details of the demographics profile is given in Table 2. Both the groups were comparable in terms of age, gender, medical illness, neurological deficit, previous surgery history, duration of stay in the ICU, nutritional status, such as weight, height, BMI and risk factor related to PU and DVT (p > 0.05) and significant difference was found in patients with SCI receiving DVT prophylaxis, type of prophylaxis, serum hemoglobin and serum albumin (p < 0.001\*)

The mean knowledge and practice scores of nurses in PU and DVT before IPP (at baseline, K<sub>0</sub>) were 12.87 ± 2.37, 12.90 ± 2.30 and 6.23 ± 1.57 and 1.55 ± 1.17 respectively. The mean knowledge scores of nurses related to the PU and DVT in first

**Table 2:** Demographic profile of patients with SCI.

n=73				
Demographic characteristics		Group I f (%) n <sub>1</sub> =30	Group II f (%) n <sub>2</sub> =43	p value
Age (years) <sup>a</sup>		36.56±13.37	41.44 ±16.25	0.184
Gender <sup>b</sup>	Male	26(87)	36 (84)	1.000
	Female	4(13)	7 (16)	
Any medical illness <sup>b</sup>	No	25 (83)	39 (91)	0.473
	Yes	5 (17)	4 (9)	
Neurological deficit <sup>c</sup>	Complete	3(10)	2 (5)	0.396
	Incomplete	27(90)	41 (95)	
Surgery done	Yes	30(100)	43(100)	-
Any history of previous surgery <sup>c</sup>	Yes	2 (7)	0 (0)	0.166
	No	28(93)	43(100)	
Duration of stay in ICU <sup>a</sup>		4.96 ± 3.36	6.97 ± 8.50	0.223
Patient receiving DVT prophylaxis <sup>c</sup>	Yes	11 (37)	43(100)	0.001*
	No	19 (63)	0 (0)	
Type of Prophylaxis <sup>c</sup>	Mechanical	11 (36)	42(97.6)	0.001*
	Mechanical + Pharmacological	0(0)	1(2.4)	
	Not receiving prophylaxis	19(64)	0(0)	
Nutritional status <sup>a</sup>	Weight(kg)	63.93 ± 6.08	62.86 ± 5.98	0.228
	Height(cm)	161.63 ±4.08	161.44 ± 6.06	0.404
BMI <sup>c</sup>	<18	19 (63.4)	31(72)	0.431
	18.5-24.9	10 (33.3)	12(28)	
	25-29.9	1 (3.3)	0 (0)	
	30 or high	0 (0)	0 (0)	
Haemoglobin (gm/dl) <sup>b</sup>	Below 10	21 (70)	14 (33)	0.002*
	10 -16	9 (30)	29 (67)	
	17 above	0 (0)	0 (0)	
Serum albumin (gm/dl) <sup>c</sup>	Below 3.5	12 (40)	5 (12)	0.010*
	3.5-5.0	18 (60)	38 (88)	
	Above 5.0	0 (0)	0 (0)	
Presence of risk factors <sup>a</sup> PU <sup>c</sup>	1-4	19 (63)	20 (47)	0.299
	5-7	11 (27)	23 (53)	
Presence of risk factor <sup>a</sup> DVT <sup>c</sup>	2	28 (93)	35 (81)	0.182
	3	2(7)	8(19)	

<sup>a</sup> Paired t test, <sup>b</sup> Pearson chi<sup>2</sup> /Fischer's exact test.

**Table 1:** Demographic characteristics of nurses.

N=52		
Demographic variables		f (%)
Age( years)		28.82 ± 3.62, (22-37) #
Gender	Male	16 (31)
	Female	36 (69)
Religion	Hindu	28 (54)
	Christian	20 (38)
	Muslim	1(2)
	Others	3 (6)
Basic qualifications	10 + 2	50 (95)
	General B.Sc.	2 (5)
Professional qualifications	GNM	17( 33)
	B.Sc.(N)	32 (61)
	M.Sc.(N)	3 (6)
Work experience in the ICU (years)	<1	4.03 ± 3.03 (0.3-15) #
	1-5	3 (6)
	5-10	25 (48)
Total work experience (years)	1-5	5.98 ±3.79 (0.3-16) #
	6-10	26 (50)
	11 & above	21(40)
In-service education attended	PU(Yes)	5 (10)
	PU (No)	13 (25)
	DVT(Yes)	39 (75)
	DVT(No)	7(13)
mean ± SD (Range)#		45(87)

post-test (K<sub>1</sub>) immediately after IPP were 16.23 ± 1.60 and 17.08 ± 1.49 respectively. The mean knowledge and practice scores of the nurses on PU and DVT on 15<sup>th</sup> day following IPP (post test 2, K<sub>2</sub>, P<sub>1</sub>) were 15.77 ± 1.88, 16.29 ± 1.80 and 8.44 ± 1.046, 8.21 ± 1.28 respectively. There was significant improvement seen in both knowledge and practice scores of nurses related to PU and DVT at post test 1 and 2 (p value < 0.001\*) (Table 3).

In Group I, before the implementation of IPP, 16.6% patients with SCI developed PU of which, 4 (13.3%) patients had PU of grade I and 1 (3.3%) had PU of grade II, while after the programme only 2 admitted patients(2/43, 4.6%) developed PU of grade I. Due to small sample size p value could not be

computed. There was reduction in the occurrence of PU in Group II as compared to Group I both in terms of number of patients developing PU and severity from 16.6 % to 4.6 %. Occurrence of DVT could not be checked as none of the patients before or after the IPP developed DVT, however use of DVT mechanical prophylaxis by the nurses increased on SCI patients after the IPP (Table 4). The IPP was moderately acceptable to majority of nurses (84%) (Table 5).

### Discussion

Major findings of the study revealed that majority of nurses working in TICU did not attend any in-service education programme related to PU and DVT. There was significant improvement in mean knowledge scores related to PU and DVT immediately after and on day 15 following the IPP. Similarly the practice scores of nurses related to PU and DVT on day 15 following the IPP were significantly higher than the baseline scores. The occurrence of the PU in patients with SCI declined after the IPP. Though the SCI patients in group II were better in terms of their hemoglobin and serum albumin levels, but we could find the use of mechanical prophylaxis for DVT on SCI patients statistically higher in group II, which suggests the efficacy of the IPP programme. Before the study there was no written protocols or monitoring charts related to risk assessment, prevention, management and documentation of PU and DVT existed in our TICU. The developed program (IPP) would help in providing standardized protocol based care to our SCI patients. Majority of nurses expressed moderate acceptability towards the IPP. The same can be attributed to the human nature to resist the change introduced in the system in terms of introduction of monitoring charts for PU and DVT. We hope to have nurses showing high acceptability to the IPP in future.

Ongoing in-service education programme is very much essential to promote knowledge and required skills for the nurses. In the present study baseline knowledge and practice scores of the nurses related to PU and DVT were low. The low scores of the nurses could be attributed to non-attending of any in-service education programme. Similar findings were reported by Bhatti M, et al. [10], Horn S.D, et al. [11], Mallah Z, et al. [12], Nuru N, et al. [13], Das S, et al. [2], Altun I, et al. [3], Magnani F.L, et al. [14], in which knowledge and practices of nurses related to PU and DVT improved following the programme. The slight reduction in the knowledge scores

**Table 4:** Acceptability of the ICU Prophylaxis Programme by the nurses.

N=52	
Acceptability Scores	f(%)
Highly acceptable (25-21)	4(8)
Moderately Acceptable (20-15)	44 (84)
Less Acceptable (below14)	4 (8)

\*Significant at p<0.05

**Table 5:** Occurrence of PU and DVT among SCI patients before and after the IPP.

n= 73			
No. of SCI patients with PU f (%)	Grades of Pressure Ulcer	No. of SCI patients with DVT	
Group I (n <sub>1</sub> = 30)	I	0	
	II		
Group II (n <sub>2</sub> =43)	I	0	

of the nurses related to PU and DVT was observed in the present study, which is normally expected, suggests retention of knowledge and practice skills among the nurses. Findings of the present study revealed that the implementation of IPP not only improved the knowledge and practice scores of the nurses but also the occurrence of PU decreased from before intervention to post intervention period. These findings are in-line with the findings of Mallah Z, et al. [12], Boddi M, et al. [1], Shahin S.M, et al. [15], Antle D. Leafgreen P [16], who reported significant reduction in the occurrence of PU among the patients after the educational programme for the nurses. However in the present study data could not be statistically computed due to small number of patients with SCI developing PU. In our study none of the patients developed DVT before or after the IPP, but the use of DVT mechanical prophylaxis by the nurses on patients with SCI improved after the IPP.

In the present study, majority of the nurses had expressed moderate acceptability towards IPP suggesting the effectiveness of the programme. Only few nurses had expressed less acceptability towards programme. The possible reason for less acceptability could be the normal human nature to show resistance to change, and same could be overcome by the reinforcement.

Present study is one of its kind in which IPP was taught to the nurses in a small group, and their doubts were cleared.

**Table 3:** Knowledge and practice scores of the nurses related to PU and DVT before and after the IPP.

N=52						
Knowledge & Practice Scores	Baseline (K <sub>0</sub> ) mean ± SD (range)	Post-test 1(K <sub>1</sub> ) mean ± SD (range)	p value (Between K <sub>0</sub> & K <sub>1</sub> )	Post-test 2(K <sub>2</sub> ) mean ± SD (range)	p value (Between K <sub>1</sub> & K <sub>2</sub> )	p value (Between K <sub>0</sub> & K <sub>2</sub> )
Knowledge (PU)	12.87 ± 2.37 (6-16)	16.23 ± 1.60	0.001*	15.77 ± 1.88	0.269	0.001*
Knowledge DVT	12.90 ± 2.30 (6-16)	17.08 ± 1.49	0.001*	16.29 ± 1.80	0.217	0.001*
Practice PU	6.23 ± 1.57 (3-9)	-	-	8.44 ± 1.04 (5-10)	-	0.001*
Practice DVT	1.55 ± 1.17 (1-4)	-	-	8.21 ± 1.28 (1-4)	-	0.001*

Paired t-test \*, p<0.05; repeated measures ANOVA\*, p<0.05.

Supervision and reinforcement of the IPP was ensured in the unit by the researcher with the ward in-charge. Our study has certain limitations. The small sample size, single center study and absence of control group of nurses limit the generalizability of the findings. There is need to assess the long term effect of the IPP in terms of reduction in occurrence of PU and DVT. The study can be replicated using large sample size in different setting and the effectiveness of IPP can be tried on bedridden unconscious with head injury, stroke, encephalopathy patients etc. The developed IPP for patients with SCI can be used to teach the nurses at pre-service and in-service level so that they could perform risk assessment, practice preventive measures and manage PU and DVT in a systematic manner.

## Conclusion

IPP improved the knowledge and practice scores of the nurses in PU and DVT and reduced the occurrence of PU among SCI patients and the use of mechanical prophylaxis by the nurses on patients with SCI for preventing DVT increased.

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