ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 02, pp.26189-26198, February, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

EFFECT OF EDUCATIONAL PROGRAM REGARDING MECHANICAL PROPHYLAXIS OF DEEP VENOUS THROMBOSIS ON NURSE'S KNOWLEDGE AND PRACTICE

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ARTICLE INFO

Article History:
Received 11th November, 2015
Received in revised form
16th December, 2015
Accepted 23cd January, 2016
Published online 14th February, 2016

Key words:
Deep Venous Thrombosis.
Mechanical Prophylaxis of Deep Venous Thrombosis.
Sequential Compression Devices.

ABSTRACT

Aim: This study carried out to evaluate the effectiveness educational program regarding mechanical prophylaxis of deep venous thrombosis on nurse's knowledge and practice.
Methods: Fifty registered nurses were working in the surgical and orthopedic words at king fahed hospital who is assigned for caring for patients post –operatively. Tools: two tools: Tool (1): Nurse's Knowledge Regarding to DVT Disease, and its Preventive Measures Questionnaire Sheet. Tool (2): Two Observational Check lists for Nurses' Practice Regarding to 1- Nursing Role in Assessment and 2- Using of Mechanical Prophylaxis of DVT.
Results: findings revealed that there is a highly significant difference between pre and post evaluations scores in relation to nurse's knowledge and performance after completion of the educational program.
Conclusion: based on research findings, that participation in the educational program for mechanical prevention of DVT made differences in nurse's knowledge and performance.

Citation: **Dr. Nagla Hamdi Kamal Khalil and Dr. Khadiga Alhefnawi, 2016.** "Effect of Educational Program Regarding Mechanical Prophylaxis of Deep Venous Thrombosis on Nurse's Knowledge and Practice", *International Journal of Current Research,* 8, (02), 26189-26198.

INTRODUCTION

Deep venous thrombosis, (DVT) is the formation of a blood clot (thrombus) within a deep vein, predominantly in the legs Heit (2011). It is estimated that about 2000 people die as a result of venous thromboembolism (VTE) each year and 30,000 are hospitalized with this diagnosis in the United States. American Public Health Association. (2010). It is the primary cause of pulmonary embolism (PE). DVT results from conditions that impair venous return, lead to endothelial injury or dysfunction, or cause hypercoagulability. A potentially life –threatening complication, is caused by the detachment (embolization) of a clot that travels to the lungs (Collins *et al*., 2012). Deep Vein Thrombosis (DVT) is an important cause of morbidity. Without adequate treatment, lower extremity DVT has a 3% risk of fatal PE (Bynke *et al*., 2013). Risk of recurrent DVT is lowest for patients with transient risk factors (eg, surgery, trauma, temporary immobility) and greatest for patients with persistent risk factors (eg, cancer), idiopathic DVT, or incomplete resolution of past DVT (residual thrombus). In the 10 years following a DVT, approximately a third of individuals will have a recurrent episode Collins *et al*., 2012). Death from an unexpected PE remains common and the majority of these occur in hospitalized surgical patients. Australian and New Zealand Working Party (2012). Without improvement in the use of DVT prophylaxis in surgical patients, unexpected PE will remain a serious problem (Bonner *et al*., 2013). High risk for developing deep vein thrombosis is found in patients with the condition such as stroke (59-100%), orthopedic surgery (17-84%), elective surgery (3-70%) and trauma (40-60%) (Collins *et al*., 2012). The five most frequent co-morbidities were hypertension (50%), surgery within 3months (38%), immobility within 30 days (34%), cancer (32%) and obesity (27%) (Carryer *et al*., 2014). Studies revealed that the incidence for DVT for certain surgeries as the following: general abdominal surgeries are 3-51%, splenectomy 20-45%, thoracic surgeries 7-45%, peripheral vascular surgeries 29-43%. Heit (2012). The post surgical patient is at a high risk for the development of DVT, prophylaxis has been reported to significantly

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reduce DVT morbidity and mortality by 50% to 80%. Best Practice (2011). Hospital patients are at higher risk for DVT because of their limited mobility, active disease processes, and co morbidities (A Guide for Effective Quality Improvement, 2013). It is estimated that one in 100 patients admitted to a hospital dies because of PE. It appears possible than more than one-half of these at-risk patients could be saved if effective prophylaxis was used Gardner and Gardner, (2012). For example, patients undergoing major operations without receiving prophylaxis are put at risk of fatal PE and stand an even greater risk of morbidity from related conditions Geerts *et al*. (2013). Among patients discharged from hospitals, DVT was the second leading cause of medical complications and prolonged length of stay, and third leading cause of preventable mortality and excessive hospital charges. With appropriate prophylaxis, including pharmacological and/or mechanical, many of these thromboembolic events can be prevented Heit (2012). There are two types of DVT and PE prevention. Mechanical and pharmacological. Mechanical prevention includes ambulation, the use of compression stockings, leg elevation, and sequential compression devices (SCD's). Compression stockings are tight elastic stockings that are worn by people in the hospital or by people who can't be active to prevent a blood clot. They work by decreasing the "pooling" of blood in the legs. Leg elevation and SCD's work the same way. Hanks (2013). Different preventative measures are used. Walking and calf exercises reduce venous stasis because leg muscle contractions compress the veins and pump blood up towards the heart. In immobile individuals, physical compression methods improve blood flow. Gardner and Gardner (2012).

Mechanical devices, such as SCDs, are the first choice for DVT prophylaxis. These methods are as efficacious and reduce risk as much as pharmacologic methods, without causing bleeding complications Horak *et al*. (2013). SCD's are plastic devices that are fit on the legs, shaped like "sleeves" and they inflate in a sequential way (i.e. from bottom to top) in order to empty the veins in the legs. This imitates walking and helps prevent blood clots. Patient should wear SCD's at any time they are in bed or sitting in a chair. These methods have been shown to decrease the number of DVT's in hospitalized patients by 20%. Sequential compression devices (SCDs) have been used in hospitals for over 45 years to combat DVT. (Gagan, and Taylor, 2011). Early mobilization, leg elevation, and an anticoagulant are the recommended preventive measures, Bonner *et al*. (2013). In general, the preventative measures, whether it be mechanical or medications, should be continued until the risk is over or significantly decreased. Center for Medicare, 2011. This is generally thought to be once a hospitalized patient is walking several times per day. Further research and data collection on SCD use in adults are needed to develop educational programs for nurses and patients. Recent studies found SCD compliance increased 4% after nursing staff were educated on proper use of SCD Cohen *et al*. (2012). Nurses can play a major role in DVT prevention if well educated and empowered to change hospital culture as this study has demonstrated. Their increased level of knowledge undoubtedly leads to an improvement in the delivery of patient care. Michota (2013). Appropriately trained nurses are skilled in assessing the risk of DVT in their clients and ensuring prophylactic measures are in place for those clients who are particularly vulnerable to developing DVT. Mismetti *et al*. (2014). Even in the absence of a medical practitioner, the nurses can initiate appropriate mechanical measures. It is therefore vital that surgical nurses accept responsibility for ensuring the safety of their clients by routinely assessing for DVT and for checking that the appropriate prophylactic measures have been initiated for all hospitalized patients. Department of Health, (2013). Recently, a marked increase has occurred to raise awareness and acknowledge the need for DVT prevention and an attempt to improve DVT prophylaxis. As prevention is better than cure, mechanical prevention therapies are effective for patients at moderately high risk for DVT. Carryer *et al.* (2014). It should begin on admission and continue as long as the patient has limited mobility. Nursing is the cornerstone of DVT prevention (NSW Health, 2012). Comprehensive patient education and nursing proficiency in mechanical prevention therapies can improve patient care and reduce illnesses and deaths from DVT Sajid *et al*. (2014). This study intended to evaluate the effectiveness educational program regarding mechanical prophylaxis of deep venous thrombosis on nurse's knowledge and practice.

MATERIALS AND METHODS

Design: Pre-post study design was used (Quasi experimental without control study).

Setting: The present study was conducted in surgical and orthopedics units -King Fahed Hospital –Al Madinah El-Menawarah.

Subjects: All available nurses' Fifty registered nurses were working in the surgical words and orthopedic unit at king fahed hospital who is assigned for caring for surgical patients post –operatively. They were assessed for their knowledge regarding to DVT and its preventive measures as well as their role in assessment of DVT and practice in using a mechanical prevention of DVT between the months of December 2013 and February 2014. After this observation, nurses were given educational program on evidence based information on DVT and its preventive measures. Following this educational sessions, a second observation was completed between the months of July 2014 and September 2015.

Inclusion criteria: All available nurses in the previous units who did not have or attend any previous specialized courses in mechanical prophylaxis for DVT patient and working in surgical or orthopedic wards for at least 1 year.

Tools of data collection: Collecting data for this study by using two tools:
Tool (1): Nurse's Knowledge Regarding to DVT disease, and its Preventive Measures Questionnaire Sheet:

This is a structured questionnaire sheet was designed by the researcher and adopted from previous research references after reviewing related literature Tooher *et al*. (2014) and Wells *et al*. (2013). This questionnaire was administered to the subjects twice; one before the educational program (pre- test) and the second time after finishing educational program sessions (post- test).

Part (1): Sociodemgraphic data of the nurse as well as educational level, and years of experience.

Part (2): It contained 10 items, the scores of total knowledge 20 points were allocated as follows; competed (2), incomplete (1), wrong or no answer (0). And categorized into three sub score levels.

- Good: 20 -16 Points.
- Moderate: 15- 11 Points.
- Poor: 10- 0 Points.

Tool (2): Observational Check list for Nurses' Practice Regarding to Nursing Role in Assessment and Using of Mechanical Prophylaxis of DVT:

This tool was developed by the researcher after thorough literature review and based on educational nursing program it is consists of two parts:

Part (1): Nurse's Role in Assessing DVT: It provides general, brief report about the nurse's ability and skills related to assessment of DVT and determining of risk factors of any case Caprini (2003).

Part (2): Nursing practice in using of mechanical prophylaxis of DVT as well as the safe and correct SCD use (SCD protocol). This observational checklist was developed by the researchers after thorough literature review and it was revised by medical and nursing experts. It is included 32 items, for each sub-item, if done correct and complete, gained (2), and if done incomplete (1) but if not done or wrong; (0). The total scoring system of the tool was 64 points and categorized in to three sub score levels.

- Good: 64 -56 Points.
- Moderate: 55- 44 Points.
- Poor: 43- 0 Points.

The content validity of the observational checklist was achieved through a panel of experts in medical and nursing field. Based on the comments and suggestions modifications were carried out. After this it was tested for reliability on a sample of 10 % of the subject's sample.

Program construction

This was pre assessment using the interviewing questionnaire, observational checks list as well as, literature review. The educational program components include: the safe and correct SCD use. (SCD protocol), as well as the nursing role in assessment and prevention of DVT. The components was distributed and rendered for nurses through three sessions, developed and carried out by the researcher for the purpose of improving nurses' practice and knowledge who caring for post operative patients. The first session for (providing specialized knowledge about DVT definition, types, causes, risk factors, investigations, treatment. As well as the role of the nurse in preventing DVT for post operative patients), the second (role of the nurse in assessing risks of DVT in post operative patients by using Thrombosis Risk Factor Assessment Scale (caprini scal), and the third one is for implementing safe and correct SCD use. (SCD protocol). The researchers provide enormous of devices, audio-visual materials that attract the subject's attention, summarizes information for easy recall and promote deeper understanding. The average time needed for the completion of each session was between 30- 45 minutes. These contents were accumulated in a manual which was distributed to all subjects.

Method

- A written permission to conduct the study was obtained from the administrative authorities of the hospital and the head of the surgical and orthopedic departments.
- The study tools were tested for its content validity by five nursing experts from different nursing and medical specialties and the necessary revisions and modification were done.
- A pilot study was carried out on 10% of the study sample who were excluded from the study subjects in order to re-assess the clarity and the applicability of the tool. Any necessary modification was done after the pilot study.
- The researchers emphasized to the subjects that participation in the study was entirely voluntary, and the anonymity and confidentiality of responses were assured.
- Data were collected during the period from December 2013 to February 2014 (first observation). To establish data base.
- The researchers observed the subjects for their performance and practice during both assessment of the case and management for care.
- Nurses were interviewed face to face and were given educational guidelines on evidence based information on DVT and its preventive measures, as well as their practice in using a mechanical prevention of DVT after organizing the educational program and dividing it in to three sessions. During the period from February 2014 to July 2014.
- A second observation was completed between the months of July 2014 and September 2014. Nurse's knowledge about DVT and its preventive measures as well as their practice in using a mechanical prevention of DVT was assessed before and after the educational guidelines.
- Statistical analysis:
- Statistical analysis was performed using the SPSS package version 19.
- Mean and standard deviations were used.

- Arithmetic mean, standers deviation, and percentage were used.
- Tests were considered significant when $P < 0.05$.
- Pre and post test score comparison.
- Pre and post observational data comparison.
- Correlation coefficient was carried out to examine the correlation between knowledge, performance and some demographic characteristics of the subjects.

RESULTS

The present study aimed to:

- Evaluate the effectiveness educational program regarding mechanical prophylaxis of deep venous thrombosis on nurse's knowledge and practice.
- Analysis of data was presented as description of demographic data of the subjects. Statistical and correlation analysis were conducted to test the effect of educational program on knowledge and performance of the nurses.

Table 1. Sociodemgraphic characteristics of the study participants' (n= 50)

Variables	N	%	Mean ± SD
Age / year ≤ 30	18	36.0	
>35	32	64.0	33.94 ± 5.74
Total	50	100.0	
Sex			
Male	12	24.0	
Female	38	76.0	
Total	50	100.0	
Marital Status			
Married	37	74.0	
Not married	13	26.0	
Total	50	100.0	
Educational Level			
Diploma	34	68.0	
Baccalaureate degree	14	28.0	
Master degree	2	4.0	
Total	50	100.0	
Department			
General surgery	29	58.0	
Orthopedic	21	42.0	
Total	50	100.0	
Work experience/year			
3-7	14	28.0	
-11	9	18.0	
-15	16	32.0	11.14 ± 4.90
-19	11	22.0	
Total	50	100.0	
Experience of the current Department/year			
1-3	22	44.0	
4-6	17	34.0	4.22 ± 2.33
7-9	11	22.0	
Total	50	100.0	

Table (1) shows the distribution of the sample according to socio-demographic characteristics. It can be noticed that the largest proportion of the subject (48%) were in the age group between 31-40 years. Regarding to sex more than three quarter of the sample (76%) of the subjects was female, and the majority (74%) of them was married. In relation to educational level, more than two third (68%) of the subjects were having diploma level of education, also more than half (58%) were work in general surgery department, and most of them (36%) have 11 to 15 years of experience in surgical specialty.

Table 2 indicates highly significant differences found among study variables Knowledge, assessing DVT and practice between pre and post educational program.

Table (3) statistical analysis showed that there is a significant difference between pre and post test scores; the mean score of written post test were significantly higher than pretest score. The table revealed that (40%) of the subjects had wrong answer about definition of DVT before the educational nursing program; while (72%) had wrong answer about Diagnostic tests for DVT, Complications of DVT. But after educational nursing program, (90%) of the subjects had right complete answer about definition of DVT, and (90%), (84%) had right complete answer about Diagnostic tests for DVT, Complications of DVT.

A highly statistical significant in all items of total Nurse's knowledge between before and after the nursing program.

Table (4) the majority (58%) of subject did not perform the DVT assessment for high risk patients, and (38%) was observed during the assessment of the Nurse for DVT who were done it in a wrong manner before the educational nursing program, while the majority (94%) of them done the assessment in a correct and complete manner after educational nursing program. There was highly statistical significant difference in Nurse's role in assessing DVT for subjects before and after of educational nursing program.

Table (5) statistical analysis revealed that a significant differences between pre and post test evaluation regarding to nurse' performance. The table shows that more than half (66%) of the subject were observed during wearing the patient an elastic stocking they done it in a wrong technique; and more than half (60%) of them did not elevates patient legs by bellow, and (38%) did not ask the patient to move from bed before the educational nursing program, while after the nursing educational program, more than three quarters (84%) of the subject were observed during wearing the patient an elastic stocking they done it in a correct technique; and the majority (92%) of them elevated the patient legs by bellow, and (96%) asked the patient to move from bed. There was highly statistical significant difference in nursing practice in using mechanical prophylaxis for subjects before and after of educational nursing program.

Table (6): Correlation between Total Nurse's knowledge, Nurse's role in assessing DVT, Nursing practice in using mechanical prophylaxis and socio demographic characteristics of the subjects. Table (6) this table illustrate the Correlation between total Nurse's knowledge, Nurse's role in assessing DVT, Nursing practice in using mechanical prophylaxis and socio demographic characteristics of the subjects, there were positive correlation between total Nurse's knowledge, Nurse's role in assessing DVT, Nursing practice in using mechanical prophylaxis and level of education as well as years of experience in the surgical specialty.

Table 2. Mean of Total Nurse's knowledge, Nurse's role in assessing DVT, and Nursing practice in using mechanical prophylaxis among subjects before and after educational program

Item	before	After	Paired t-test	
	Mean ± SD	Mean ± SD		
Total Nurse's knowledge	5.08 ± 1.61	18.34 ± 1.62	t=44.697	P≤.001 (H.S)
Nurse's role in assessing DVT	0.46 ± 0.58	1.9 ± 0.24	t=5.619	P≤.001 (H.S)
Nursing practice in using mechanical prophylaxis	19.56 ± 3.51	60.38 ± 3.72	t=55.837	P≤.001 (H.S)

Table 3. Percentage distribution of Total Nurse's knowledge for subjects before and after the educational program

Total Nurse's knowledge	Before						After						Paired t-test
	Wrong		Incomplete		Complete		Wrong		Incomplete		Complete		
	N	%	N	%	N	%	N	%	N	%	N	%	
Definition of DVT	20	40	26	52	4	8	2	4	3	6	45	90	
Causes of DVT	31	62	17	34	2	4	3	6	4	8	43	86	
Risk factors for DVT among post operative patients	28	56	18	36	4	8	3	6	4	8	43	86	
Signs & Symptoms of DVT	21	42	26	52	3	6	4	8	3	6	43	86	
Diagnostic tests for DVT	36	72	13	26	1	2	2	4	3	6	4	90	
Complications of DVT	36	72	13	26	1	2	4	8	4	8	42	84	
The main medications for DVT	23	46	25	50	2	4	1	2	4	8	45	90	
Nursing management to avoid DVT among post operative patient?	24	48	25	50	1	2	0	0	3	6	47	94	
Types for DVT prevention in post operative patients	24	48	25	50	1	2	3	6	5	10	42	84	t=44.697
Types of mechanical prevention for DVT used for post operative patients?	25	50	22	44	3	6	0	0	6	12	44	88	P≤.001 (H.S)

Table 4. Percentage distribution of Nurse's role in assessing DVT for subjects before and after of educational program

Nurse's role in assessing DVT	N	%	Mean ±SD
Before:	29	58	0.46 ±0.578
Not done			
Incomplete	19	38	
Complete	2	4	
After:			
Not done	0	0	1.94 ± 0.239
Incomplete	3	6	
Complete	47	94	

Table 5. Mean scores differences of pre-posttest nurses' Practice about DVT mechanical prophylaxis (n=50)

Practice Components	Pretest Practice	Posttest Practice
General patient care	2.76 ± 0.98	9.44 ±1.15
Preparation for SCD	1.12 ± 0.77	3.78 ± 0.46
Assessment of patient with SCD	5.24 ±1.85	19.12 ± 1.51
Nursing role for patient with SCD	2.62 ± 1.14	9.20 ±1.25
Care for SCD	7.82 ± 2.55	18.82 ±1.59
Total mean ±SD	19.56± 3.51	60.38± 3.72
Paired t test		
t=55.837 P≤.001 (H.S)		

Table 6. Correlation between Pre-post assessment for Total Nurse's knowledge, Nurse's role in assessing DVT, Nursing practice in using mechanical prophylaxis and socio demographic characteristics of the subjects.

Correlations

Variable		age	educational level	unit	general experience	specialty/ experience	Total pretest knowledge	Total posttest knowledge	Total Pretest practice	Total Posttest practice	Assessment of the case	Assessment of the case
age	Pearson Correlation	1	.304*	-.112	.970**	.671**	-.114	-.309*	-.144	-.094	.211	-.092
	Sig. (2-tailed)		.032	.437	.000	.000	.430	.029	.318	.514	.141	.527
educational level	Pearson Correlation	.304*	1	.032	.351*	.249	.013	-.271	-.187	-.115	.045	-.139
	Sig. (2-tailed)	.032		.825	.012	.081	.931	.057	.194	.425	.756	.335
unit	Pearson Correlation	-.112	.032	1	-.150	-.134	-.474**	.123	-.009	-.132	-.188	.215
	Sig. (2-tailed)	.437	.825		.299	.355	.001	.397	.951	.362	.191	.134
general experience	Pearson Correlation	.970**	.351*	-.150	1	.734**	-.105	-.339*	-.160	-.064	.229	-.062
	Sig. (2-tailed)	.000	.012	.299		.000	.470	.016	.267	.657	.110	.668
specialty/ experience	Pearson Correlation	.671**	.249	-.134	.734**	1	-.135	-.246	-.060	-.003	.105	.061
	Sig. (2-tailed)	.000	.081	.355	.000		.350	.084	.678	.985	.468	.676
Total pretest knowledge	Pearson Correlation	-.114	.013	-.474**	-.105	-.135	1	.161	.096	.226	.156	-.198
	Sig. (2-tailed)	.430	.931	.001	.470	.350		.265	.506	.115	.278	.168
Total posttest knowledge	Pearson Correlation	-.309*	-.271	.123	-.339*	-.246	.161	1	.259	.130	.026	.211
	Sig. (2-tailed)	.029	.057	.397	.016	.084	.265		.069	.368	.860	.142
Total pretest practice	Pearson Correlation	-.144	-.187	-.009	-.160	-.060	.096	.259	1	-.020	-.009	.065
	Sig. (2-tailed)	.318	.194	.951	.267	.678	.506	.069		.892	.951	.654
Total posttest practice	Pearson Correlation	-.094	-.115	-.132	-.064	-.003	.226	.130	-.020	1	-.064	-.157
	Sig. (2-tailed)	.514	.425	.362	.657	.985	.115	.368	.892		.660	.277
Pretest assessment of the case	Pearson Correlation	.211	.045	-.188	.229	.105	.156	.026	-.009	-.064	1	-.091
	Sig. (2-tailed)	.141	.756	.191	.110	.468	.278	.860	.951	.660		.529
Posttest assessment of the case	Pearson Correlation	-.092	-.139	.215	-.062	.061	-.198	.211	.065	-.157	-.091	1
	Sig. (2-tailed)	.527	.335	.134	.668	.676	.168	.142	.654	.277	.529	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

DVT is an important cause of death in hospitalized patients, and treatment of non-fatal symptomatic DVT and related long-term morbidities is associated with a considerable cost to the health service. As the deaths due to DVT occur before treatment can be instituted and the post thrombotic syndrome occurs in spite of treatment, the only way to prevent these complications is to prevent DVT from occurring. DVT is recognized as having a high risk in a proportion of surgical clients in the acute care system with about 50% of all cases of DVT occurring following recent hospitalization. Curtis (202). The role and status of nursing has improved dramatically over the last few decades and continually evolves. Many factors have influenced the delivery of high quality healthcare by the nursing profession including health service restructuring, technological advances, increased postgraduate nursing education, a relative shortage of medical practitioners and the increasing recognition of the expert clinical skills of nurses in providing optimum healthcare as nurses are well positioned to change the culture and improve outcomes for patients Schober, (2013); Shojania *et al*. (2014). The aim of this study is to evaluate the effectiveness educational program regarding mechanical prophylaxis of deep venous thrombosis on nurse's knowledge and practice. Regarding to educational level, the study illustrated that, the majority (68%) of the nurses was have diploma degree this result may be interpreted in the light of Sorensen's *et al*. (2012) who stated that the lower educational level of the nurse can decrease their response and level of acquiring information and managing complex topics and situations than their degrees of educational level. As regard to years of experience in nursing specialty. The result of the present study showed that, the majority (72%) of the sample have 1 to 5 years experience in surgical specialty. This result is very similar to Thiel *et al*. (2011) who revealed that, it has been postulated that years of experience is directly proportional to the level of education, the more the years of experience, the higher the level of knowledge. Moreover, (Turner and Benty, 2012) who conducted that more experience increased the cognitive resources available for interruption of data resulting in increased knowledge. They added also that the experience determines the correct region for assessment, select relevant data, and recognize the changing relevance of cues as the situation evolves.

Furthermore, statistical analysis indicated that there was a significant statistical difference in the mean score between the pre and post evaluation related to total Nurse's knowledge, the post evaluation showed marked improvement than the pre evaluation. Educational program and its contents regarding to knowledge aspect which helped the subjects to memorize information, categorized the assessment, and acquired the specific nursing management for each case based on the risk factors. Moreover, the subjects stated that the educational program was constructed in a way that save time and effort these view points are consistent with Browen *et al*. (2012) who studied the effect of physical assessment training program on knowledge and performance skills. He used body system approach as a guide sheet for data collection. His study findings revealed that significant increase nurse's knowledge and ability to interpret and report patient findings to other health professional. In relation to nurse's role in assessing DVT, the present study showed that the majority (58%) of subject did not perform the DVT assessment for high risk patients, and (38%) was observed during the assessment of the Nurse for DVT who were done it in a wrong manner before the educational nursing program, while the majority (94%) of them done the assessment in a correct and complete manner after educational nursing program. This was congruent with Ziegler *et al*. (2013), who indicated that, the assessment of patients who may be at risk is not uniformly undertaken and despite the availability of evidence based guidelines for DVT prophylaxis, many patients receive no prophylaxis and are thus unknowingly at risk for DVT development in hospital and for some weeks following discharge. And this is in line with the study findings regarded to the importance of DVT assessment Beck (2013) who mentioned that, it is important to assess according to their individual DVT risk, taking into account their clinical condition, the appropriateness of the prophylaxis for the individual patient. The assessment for DVT prophylaxis should occur on admission to hospital and prophylaxis should commence without undue delay and be re-assessed on a regular basis to ensure prophylaxis remains appropriate.

Brendle (2012) confirmed that, Nurses working beyond the traditional role will become more accepted. This will be achieved by collaboration with other health professionals and by nurses having the confidence and expert knowledge to contribute effectively to the healthcare team. Collaboration, as stated by Collins *et al*. (2012) is about working effectively together as a team and the cornerstone of this collaborative practice is the patient, their needs and the requirement to achieve optimum outcomes. If there can be increased flexibility between nursing and other health professionals as suggested by Comerota *et al*. (2013) then certain tasks that have traditionally been considered to be non-nursing could quite effectively be undertaken by nurses. An excellent example of this is the nurse's role in risk assessment for DVT Collins *et al*. (2012). This is in line with the study findings that there was highly statistical significant difference in Nurse's role in assessing DVT for subjects before and after of educational nursing program. Recent studies revealed that, the nursing team was led by a clinical nurse consultant (CNC) qualified in DVT risk assessment and evidence based DVT prophylaxis. Various educational strategies were implemented to take ownership of DVT risk assessment. They were supported by the DVT clinical nurse consultant who demonstrated leadership by empowering the nurses to become equal partners with the other team members in the delivery of healthcare. Comerota *et al*. (2013) emphasizing the importance role of the nurse for in patients attending pre-admission clinic prior to a planned hospital admission, the nurses provided the patient with information on DVT risk and encouraging

the patient to discuss the appropriateness of DVT prophylaxis with their medical practitioner. Concerning to nursing practice in using mechanical prophylaxis for subjects before and after of educational program, there was highly statistical significant difference in nursing practice in using mechanical prophylaxis for subjects before and after of educational nursing program. This result is congruent with Clagett *et al*. (2009) who indicated that, There are two main types of mechanical devices are widely used in the prevention of DVT Graduated Compression Stockings (GCS) and Intermittent Pneumatic Compression (IPC). The National Institute for Health and Clinical Guidelines in the United Kingdom states that GCS reduce the risk of DVT by 51%. (National Institute for Health and Clinical Excellence. 2013). While studies have generally involved thigh length stockings it is accepted that below knee stockings are as effective in reducing the risk of DVT development in most patients. IPC reduces the incidence of DVT and is more effective than GCS in high risk patients in combination with anticoagulants or when anticoagulants are contraindicated Clagett and Reisch, 2014. Furthermore, an annual bedside clinical audit was conducted to evaluate the effectiveness of the program. A total of 2063 patients have been audited over five years with medical patients accounting for 62%. Overall, the majority of hospitalized patients were at risk of developing DVT and this nurse led program has seen whole of hospital appropriate DVT prophylaxis rates in at risk patients improve from 27% in 2005 to 85% in 2009. All yearly results were able to show a highly statistical significance (P< 0.000.1) in comparison to the 2005 baseline. This improvement in appropriate DVT prophylaxis in at risk patients was not associated with any increase in inappropriate administration of DVT prophylaxis in patients not at risk Cohen *et al*. (2013). These results confirmed the results of the present study. As regard to nursing role in wearing patient an elastic stocking, the present study showed that the more than half (66%) of the subject were observed during wearing the patient an elastic stocking they done it in a wrong technique; before the educational nursing program, while after the nursing educational program, more than three quarters (84%) of the subject were observed during wearing the patient an elastic stocking they done it in a correct technique; this result is highlighted with Kahn (2014) who mentioned that, to be effective, GCS or IPC should be measured and fitted for the individual patient and should be worn continuously during the period of immobility to the return of full ambulation. Patient compliance is essential e.g. ensuring their stockings are not rolled down to the ankle. Incorrectly fitting stockings invariably do not provide the graduated compression required for prophylaxis and can cause more harm than benefit to patients.

Concerning to nursing role in elevating patient legs in bed, the present study showed that more than half (60%) of the subject were observed during care for post operative patients they did not elevate patients leg; before the educational nursing program, while after the nursing educational program, the majority (92%) of the subject were observed during care for post patient they elevate the patient's leg by using billow; this result is in congruent with Gagan *et al*. (2012) who stated that, venous stasis is a predisposing factor for DVT. Leg elevation is a simple intraoperative and postoperative technique for improving venous drainage from the lower extremities, which minimizes venous stasis. As regard to Examining the area of SCD unit every 8 hours for pain, cyanosis, numbness, and skin changes the present study showed that the more than half (52%) of the subject were observed during care for post operative patients they did not examine the area of SCD unit if it is fixed to the patient for pain and (50%) for cyanosis, (58%) for numbness, and (48%) for skin changes; before the educational nursing program, while after the nursing educational program, the majority (96%) of the subject were observed during care for post patient they examine the area of SCD unit for pain, and (92%) for cyanosis, (92%) for numbness, and (96%) for skin changes; this result is in congruent with Kahn (2014) who stated that, reported complications with SCD are rare but include skin ulceration and common perineal nerve palsy. So, it is very important to examine the area of SCD unit and check the skin color, pain, and numbness every 8 hours. Furthermore, Maclellan and Fletcher (2012) stated that, there are contra-indications to prophylaxis and thus the type of prophylaxis selected must be specifically tailored to the individual patient. Most importantly, they should not be used in limbs with severe or critical ischaemia and other contraindications to mechanical prophylaxis include significant peripheral neuropathy, recent skin graft and severe leg deformity.

Conclusion

Nursing is the largest professional group involved in direct clinical care within the healthcare system. Nurses with expert knowledge and strong leadership skills can have a prominent role in influencing and implementing changes to healthcare practices Bonner *et al*. (2013). The role of the nurse is extending beyond the traditional boundaries and so a ‘patient centered’ philosophy should be adopted by all health professionals to improve relationships and reduce the requirement for territorial professional boundaries (Access Economics, 2011). The results in this study should encourage nurses to work together as key members of the multi-disciplinary team and client advocates in order to reduce the unacceptable incidence of DVT in our community. The nursing profession must adopt a ‘can do’ attitude and ensure that we actively promote measures to protect the clients who are currently in our care. In doing this, there is no doubt that lives will be saved Kahn (2014).

The following conclusions can be taken:

- This study supports the importance of nurse education on increasing DVT knowledge and its Mechanical prevention.
- Mechanical prevention of DVT can be improved with nurse education, patient education and routine monitoring.

- This relatively inexpensive and simple nursing intervention bears consideration, and could lead to reductions in the morbidity and mortality associated with DVT.

Recommendations

Based on the findings of the present study the following recommendations can be suggested.

- DVT risk assessment and appropriate prophylaxis should be mandatory for all patients requiring hospital admission.
- Systematic approaches to ensuring appropriate DVT prophylaxis are required.
- Provide DVT prophylaxis and treatment education to nurses.
- Provide DVT treatment education to patient/family and include them in plan of care.
- Continue to monitor incidence of DVT in study population.
- Future research to focus on medical patient population.

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