

Effect Of An Educational Program Regarding Care Of Venous Leg Ulcer On Nurses' Performance

Reham Moharam Serag¹, Dina E I Tabey Sobeh², Eman Saleh Shahin³, Naglaa E Lsayed Mahdy⁴

¹Assistant Lecturer at Faculty of Nursing, Port Said University.

²Assist. Prof. of Medical Surgical Nursing Faculty of Nursing, Port Said University.

³Professor of Medical Surgical Nursing Faculty of Nursing, Port Said University. ⁴Professor of Medical Surgical Nursing Faculty of Nursing, Ain Shams University.

Abstract

Venous leg ulcers (VLUs) are a major cause of morbidity and decreased health-related quality of life. Education in the practice environment is a main component of nursing programs throughout the world and is at the core of vocational education. The purpose of this study was to evaluate the effect of an educational program regarding care of venous leg ulcer on nurses' performance in general surgical units and outpatient clinic at El-Mansoura university hospital. This study used a one-group pre-post design. Sampling using a convenient sampling technique. Two tools were used for data collection; Nurse self-administrated questionnaire and wound care observational checklist. Results of the study revealed a statistically significant improvement in nurses' knowledge and practice regarding VLU care after implementing educational program with (P-value = 0.000 and 0.000 respectively). This study concludes that there is an improvement in nurses' knowledge and practice after implementing the educational program.

Key words: Assessment, Knowledge, Nurses, practice, Venous Leg Ulcer.

Article points:

This study aimed to evaluate the effect of an educational program regarding care of venous leg ulcer on nurses' performance. This aim was achieved through:

- Assess nurses' knowledge about venous leg ulcer care pre implementing educational program.
- Assess nurses' practice regarding venous leg ulcer care pre implementing educational program.
- Implement an educational program for nurses regarding care of venous leg ulcer.

- Evaluate the effect of an educational program regarding care of venous leg ulcer on nurses' knowledge and practice

Introduction:

Chronic venous disease (CVD) is a disabling and progressing disorder that affects a large portion of the world's population. Long-term exposure to genetic and environmental risk factors can cause vital biophysical and biochemical alterations in the venous system, resulting in a complicated vascular response. A growing number of research focusing on CVD demonstrate the importance of this vascular disease, particularly in its most severe phases (chronic venous insufficiency) (Nicolaidis and Labropoulos, 2019& Davies, 2019).

One of the most frequent kinds of chronic leg ulcers is the venous leg ulcer (VLU) (Singeret al., 2017). The most frequent leg ulcer treated in wound care centers is VLU, which is thought to affect 500 000–600 000 people in the United States each year. Furthermore, roughly 1% of individuals will develop a VLU at some point in their lives, according to research (Lal, 2015). These ulcers are difficult to heal, lowering the patient's quality of life and putting a financial strain on the healthcare system (Ma et al., 2014). Moreover, Leg ulcers caused by venous blood flow are sluggish to heal. In a retrospective study of 139 VLU patients, (Berenguer Perez et al., 2019) found that 27% of patients need three months to recover, whereas 46% take six months.

Clinical nursing education is crucial for nurses to improve their theoretical and practical skills. Nursing schools all around the world include practice-based education, which is at the heart of vocational training (Shivers et al., 2017). In order to achieve the best possible health outcomes, wound treatment professionals (including nurses) must have the necessary knowledge and abilities (Welsh, 2018).

Furthermore, having a high degree of knowledge influenced excellent practice toward wound care. If all healthcare workers have strong basics of knowledge, attitude, and practice, delayed wound healing or non-healing wounds might be avoided (Dilie and Mengistu, 2015).

Treatment includes wound dressing maintenance. The researchers understood the necessity of evaluating wound dressing patterns in hospitals in order to determine how to do this procedure and to begin a basic attempt to steer them to standard practices as soon as feasible (Najm and Hussein, 2018). As a result, nurses play an important role in the patient's therapeutic success and outcome by reducing the patient's risk of infection by using strict aseptic technique, inspecting the solution for signs of contamination, closely monitoring the patient before, during, and after an exchange, and recording his vital signs (Khudhair, 2018).

Venous leg ulcers (VLUs) are a major cause of morbidity and low health-related quality of life. Studies are said to affect up to 3% of the adult population globally (Guten, Fuller, & Vowden, 2018). A sufficient degree of knowledge about wound healing and wound care can reduce surgical complications, recurrent admissions, hospitalization time, and expenditures (Surme et al., 2018). As a result, it is determine that a nurse education program on venous leg ulcer treatment is necessary.

Methodology and search strategy

This study used an experimental design with a pre-experimental design approach with a one-group pre-post design. This study was carried out in general surgical units (five surgical departments) and outpatient clinic (vascular surgery clinic) at El-Mansoura university hospital, Egypt.

Sampling in this study using A convenience sampling include 50 nurse was used in the current study. all nurses working at the general surgical units and surgical outpatient clinics who accepted to participate in the study.

Data collection tools

Two tools were utilized in the current study.

Tool (I): Nurse self-administrated questionnaire:

This tool was developed by the researcher to assess nurses' socio demographic characteristics and knowledge about venous leg ulcer care and it was developed after reviewing the recent related literature (Brown, Edwards, Seaton, & Buckley, 2015, Norman et al., 2018, Rosenbaum et al., 2018 and Wound, Ostomy and Continence Nurses Society (WOCN), 2019). It included the following two parts;

Part 1: Socio-Demographic data: It was concerned with socio-demographic characteristics of nurses participated in this study e.g. age, sex, marital status, educational level, years of experience, previous training on venous leg ulcer.

Part 2: Venous leg ulcer care knowledge assessment: This part was concerned with assessment of nurses' knowledge about venous leg ulcer through 36 question distributed as the following:

- Knowledge related to venous leg ulcer definition and causes (4 MCQ items).
- Knowledge related to venous leg ulcer care (4 MCQ items).
- Knowledge related to venous leg ulcer healing (7 MCQ items).
- Knowledge about complications of venous leg ulcer (3 MCQ items).
- Nurses' knowledge regarding universal precautions (18 true or false questions).

Scoring System:

Firstly, the correct answer was pre-determined according to the literature. A score "1" was given for the correct answer, and a score "0" was given for the incorrect (misconception) or missed answer (do not know) Finally, according to Bloom's cut of point (Yusof, Rahman, & Haque, 2018).

- A total knowledge score $\geq 60\%$ was considered satisfactory.
- A total knowledge score $< 60\%$ was considered unsatisfactory.

Tool (II): wound care observational checklist:

It was adopted from (Boyle, 2014 & Estes and Andrews, 2015) and was modified by the researcher based on the related literature (WOCN, 2019 and Taylor et al., 2017). This tool measured the practice of nurses and how they demonstrated the dressing of this type of wound, it contained 35 steps (10 pre-procedure steps, 18 wound dressing procedure steps, 7 post-procedure steps).

Scoring system:

The nurses were observed while performing wound care and 35 steps related to their practices were observed. The nurses were rated in accordance to whether they performed these practices or not. A score of "1" was given for done and a score of "0" was given for not done or done incorrectly. According to bloom's cut of point (Akalu, Ayelign, &Molla, 2020).

- A total practice score $\geq 60\%$ was considered satisfactory.
- A total practice score $< 60\%$ was considered unsatisfactory.

Educational program of venous leg ulcer care:

Developing educational program regarding venous leg ulcer care after reviewing relevant literature: (Norman et al., 2017& Wound, Ostomy and Continence Nurses Society, 2019 and Taylor et al., 2017). It contained the following parts; introduction about venous leg ulcer as definition, causes, risk factors, symptoms, prevention ways in people at risk . Moreover, wound healing stages, factors affected wound healing and wound care which emphasized on base of wound care, ideal wound dressing, complete ulcer assessment according toBates-Jensen Wound Assessment tool (Bates-Jensen &Sussman, 2012), compression therapy and types of wound dressing.

Data collection technique

This study was covered in four phases:-

1- Content validity: The study tools were reviewed by a panel of nine experts from Faculty of Nursing in the field of Medical- Surgical Nursing (five experts) and physicians from faculty of medicine (four experts) to test the validity of the study tools. Afterwards, the needed modifications were applied to these tools.

2- Reliability:The internal consistency of tools has been tested using Cronbach's alpha coefficient.

Cronbach's alpha for nurses' knowledge and practice checklist of nurses were (0.766 &0.788) respectively.

3- Pilot study: A pilot study was carried out with the purpose of assessing the feasibility, objectivity and applicability of tools and estimate the proper time required for filled in each tool. It was conducted on 10.0% of nurses (5 nurses) from previously mentioned setting and it was conducted over a period of two weeks before embarking on fieldwork of the study. After obtaining the result of the pilot study, the necessary modifications were done as (nurses' level of education, received training about VLU care), and the final form was developed. The nurses included in the pilot study were excluded from the main sample.

4- Data collection:The data collection was conducted from the beginning of (September 2020) till the end of (February, 2021). The following steps concerned by the researcher:

Step1: The researcher assess nurses' practice regarding Venous Leg Ulcer carepre- implementing educational program by observational checklist while nurses perform wound dressing . This step took 8 sessions, and each session took 4 hours, from 9AM to 1 PM. The researcher was available 2 days/ week (Monday and Thursday).

Step 2: Assess the knowledge of the nurses regarding Venous Leg Ulcer care pre- implementation of the program . The researcher gave Nurse self-administrated questionnaire to studied nurses and they filled it by themselves after explaining clarification of the nature and purpose of the study. This step took 2 session and each session took 3 hours, from 9AM to 12 PM.

Step 3: Implementing the Venous Leg Ulcer care educational program. The program took around two months (two sessions per week; each taking 4 hours). Every session was divided to theoretical session and practical session as the following: The researcher gathered the studied nurses who work at the general surgical units and surgical outpatient clinics in Hospital lecture hall in accordance with their schedule and duties then gave them theoretical lecture using PowerPoint presentations and handouts, which covered all objectives of educational program as definition, causes, symptoms.....,etc. It took around 2 hours every session.

Also, the researcher demonstrate wound assessment and ideal dressing technique regarding venous leg ulcer by explaining steps of wound assessment tool and demonstrate wound care practice checklist to the studied nurses using educational videos as wound dressing procedures and photos. Then, the studied nurse re- demonstrate dressing procedure on real venous leg ulcer patient under researcher observation. This practical session took around 2 hours. The researcher was available 3 days/week (Sunday, Tuesday, and Thursday) from 9 AM to 1 PM.

Step 4- Program evaluation:

During this phase, the researcher applied the post-test to assess the effect of the program on nurses' performance. This phase was accomplished in 2 sessions. The first session was carried out after program implementation (immediate) and divided in to two phases; one to assess their knowledge about venous leg ulcer. It took 1 hour to fill tool post- implementing educational program, and the other to assess nurses' practice regarding Venous Leg Ulcer care post- implementing educational program by the researcher observation while nurses perform wound dressing. It took 2 hour. The second session was carried out after three months of program implementation at the same way. Each session took three hours, from 9AM to 12PM.

Ethical Consideration:An approval was taken from Research ethic committee of faculty of nursing, port said university. Moreover, an approval was taken from hospital director to participate in the study after explanation the study aim. In addition, an approval was taken from each nurse after explanation of the study aim and detail data collection process to be familiar with the importance of his /her participation. In addition, a brief and comprehensive explanation of the study was given to assured nurses that the information obtained will be confidential and used only the purpose of the study. The studied nurses were informed that their participation is voluntary &they have the right withdraw from study at any time without rationalization. Additionally, all data collected from the studied subjects was processed in a total confidentiality. Moreover, the process of data collection was not disturbing the harmony of the work of the above-mentioned setting.

Data analysis was performed using the SPSS (Statistic Program for Social Science) computerized program version 22., which is a descriptive analysis to see the frequency distribution of variables. Tabulated frequencies and percentages were calculated.A significant level value was considered when p- value ≤ 0.05 , while p-value > 0.05 indicates non- significant results.

Results

Table (1): socio-demographic characteristics of studied nurses (N=50).

Socio-demographic characteristic	No	%
Agein years		
20 to 30 years	24	48.0
>30 to 40 years	13	26.0
More than 40 years	13	26.0
Sex		
Male	8	16.0
Female	42	84.0
Education level		
Secondary nursing education	28	56.0
Technical nursing education	22	44.0
Marital Status		
Single	10	20.0
Married	40	80.0
Years of experience		
Less than 5 years	6	12.0
5 to less than 10 years	23	46.0
10 years and more	21	42.0
Years of experience in surgical department		
Less than 5 years	12	24.0
5 to less than 10 years	19	38.0
10 years and more	19	38.0
Received training about VLU care		
Yes	0	0
No	50	100

Table (1) above reveals that, less than half of the studied nurses 48% were at age group 20 to 30 years, most of them 84% were female, more than half of them 56% were have secondary nursing education, more than three quarters of them 80% were married, more than two fifths of the them 46% had 5 to < 10 years of experience in nursing field and more than one third of the them 38% had 5 to <10 years and ≥10 years of experience in surgical department. Moreover, all of them 100% did not receive training courses about VLU.

Table (2): Nurses' knowledge about venous leg ulcer care (N=50)

Total venous leg ulcer care knowledge	Pre- program		Post-program				X ² Test p- value
			Immediate		follow up after 3 months		
	No	%	No	%	No	%	
Satisfactory	16	32	50	100	50	100	X ² = 87.931 P= .000*
Unsatisfactory	34	68	0	0	0	0	

X² = Chi square test

*Sig. the p- value for test ≤ 0.05

In table (2) above, of the 50 nurses (100%) studied have satisfactory knowledge regarding venous leg ulcer care immediate post and follow up 3 months post the program implementation comparing to only 32% of them pre- program implementation with statistically significant differences whereas p ≤ 0.05.

Table (3): Nurses' knowledge pre, immediate and follow up after 3 months implementing venous leg ulcer care program (N= 50).

Nurses' VLU care knowledge	Pre- program	Immediate post-program	follow up after 3 months
	Mean ± SD	Mean ± SD	Mean ± SD
Nurses' knowledge about VLU .	2.04 ±1.28	3.74 ±.56	3.32 ±.68
Nurses' knowledge about VLU care.	2.76 ±.77	3.86 ±.45	3.66 ±.48
Nurses' knowledge about VLU healing.	3.56 ±.99	6.62 ±.67	5.38 ±.97
Nurses' knowledge about	.36 ±.56	2.86 ±.35	1.86 ±.57

VLU complications.			
Nurses' knowledge about infection control measures / universal precaution during wound care.	11.62 ±1.43	17.24 ±1.33	15.24 ±.96
Total	20.34 ±3.30	34.52 ±3.00	29.46 ±1.73

Table (3): shows that regarding the mean score of nurses' knowledge about venous leg ulcer 2.04 ±1.28 was lower pre-program implementation compared with this mean immediately and after three months post-program implementation 3.74±.56& 3.32±.68 respectively. In addition, the mean value about nurses' knowledge about VLU care was 2.76 ±.77 pre-program, while immediately post- program was 3.86 ±.45, and after three months post- program was 3.66 ±.48.

Moreover, regarding nurses' knowledge about VLU healing, the mean value was 3.56 ±.99 pre-program, while immediately post-program; this mean increased to 6.62 ±.67, and 3months post- program was 5.38 ±.97. In addition, regarding nurses' knowledge about VLU complications.36 ±.56 pre-program, whilst immediately post-program, and after three months post-program, this mean increased to 2.86 ±.35&1.86 ±.57 respectively. Furthermore, concerning nurses' knowledge about infection control measures and universal precaution during wound care, the mean score was 11.62 ±1.43 pre- program, whereas immediately post-program, and after three months post-program, this Mean increased to 17.24 ±1.33 &15.24 ±.96 respectively.

Table (4A): Wound care practice among the studied nurses(N=50):

Wound care practice	Pre- program				Immediate post-program				follow up after 3 months			
	Yes		No		Yes		No		Yes		No	
	No	%	No	%	No	%	No	%	No	%	No	%
Pre- procedure:												
1.Review the medical order for wound care	3	6	47	94	49	98	1	2.0	39	78	11	22
2. Gather the necessary supplies and bring it to the bedside stand or over the bed table.	50	100	0	0	50	100	0	0	50	100	0	0

3.Perform hand hygiene and put on PPE(personal protective equipment)	0	0	50	100	44	88	6	12	35	70	15	30
4. Close curtains around the bed and close room's door, if possible	2	4	48	96	43	86	7	14	13	26	37	47
5. Identify the patient	44	88	6	12	50	100	0	0	44	88	6	12
6. Explain the procedure to the patient	0	0	50	100	46	92	4	8	35	70	15	30
7. Assess the patient's need for pharmacological pain-relief interventions or analgesic medication before wound care.	6	12	44	88	48	96	2	4	30	60	20	40
8. Place waste receptacle / container or bag at a convenient location for use during the procedure.	48	96	2	4	50	100	0	0	49	98	1	2
9. Adjust bed to a comfortable working height, usually at the waist level.	7	14	43	86	48	96	2	4	20	40	30	60
10. Assist the patient to a comfortable position that provides easy access to the wound area.	48	96	2	4	50	100	0	0	50	100	0	0

Table (4 A) represents that, none of the studied nurses performed: perform hand hygiene and put on PPE, and explain the procedure to the patient pre-program, while these steps improved significantly immediately 88% & 70% respectively and after three months post- program 92 % & 70% respectively.

Furthermore, regarding the steps of, review the medical order for wound care, close curtains around the bed and close room's door, assess the patient's need for pharmacological pain-relief

interventions or analgesic medication before wound care, and adjust bed to a comfortable working height. only 6%, 4%, 12%, and 14% respectively of the studied nurses practice these steps correctly pre-program. However, these percentages improved to 98%, 86%, 96%, and 96% respectively at the immediate post-program phase, and to 78%, 26%, 60%, and 40% respectively after three months post- program.

Table (4B): Wound care practice among the studied nurses(N=50):

Wound care practice	Pre- program				Immediate post-program				follow up after 3 months			
	Yes		No		Yes		No		Yes		No	
	No	%	No	%	No	%	No	%	No	%	No	%
Wound dressing procedure:												
11. Use a waterproof pad under the wound site.	7	14	43	86	44	88	6	12	18	36	32	64
12. Put on clean, disposable gloves and loose tape on the old dressing.	46	92	4	8	50	100	0	0	48	96	2	4
13. Remove the old dressing Carefully.	50	100	0	0	50	100	0	0	50	100	0	0
14. Use small amount of sterile saline to help loosen and remove stuck dressing.	47	94	3	6	50	100	0	0	50	100	0	0
15. Note the following: amount, type, color, and odor of the dressing after removing dressing.	4	8	46	92	50	100	0	0	33	66	17	34
16. Place soiled dressings in the appropriate waste receptacle.	48	96	2	4	50	100	0	0	49	98	1	2
17. Remove gloves and dispose of them in an appropriate waste receptacle.	3	6	47	94	46	92	4	8	39	78	11	22
18. Inspect the wound site for size, appearance, and drainage.	9	18	41	82	49	98	1	2	30	60	20	40
19. Use sterile technique, prepare a sterile work area	49	98	1	2	50	100	0	0	50	100	0	0

and open the needed supplies.												
20. Open the sterile cleaning solution. And pour directly over gauze sponges.	47	94	3	6	50	100	0	0	48	96	2	4
21. Put on sterile gloves.	4	8	46	92	46	92	4	8	38	76	12	24
22. Clean the wound from top to bottom and from the Centre to the outside.	8	16	42	84	50	100	0	0	45	90	5	10
23. Use new gauze for each wipe, following this pattern.	4	8	46	92	50	100	0	0	39	78	11	22
24. Place the used gauze in the waste receptacle.	47	94	3	6	48	96	2	4	47	94	3	6
25. Dry the area using a gauze sponge in the same manner once the wound is cleaned.	5	10	45	90	50	100	0	0	39	78	11	22
26. Apply ointment or perform other treatments, as prescribed.	41	82	9	18	41	82	9	18	42	84	8	16
27. Apply a layer of dry, sterile dressing over the wound.	45	90	5	10	49	98	1	2	47	94	3	6
28. Place the second layer of gauze over the wound site.	50	100	0	0	50	100	0	0	50	100	0	0

Table (4B):shows that, regarding use a waterproof bad under the wound site, after removing dressing, note the following: amount, type, color, and odor of the dressing, and Inspect the wound site for size, appearance, and drainage. about 14%, 8%, and 18% respectively of the studied nurses correctly practice these steps pre-program, while these percentages improved to 88%, 100%, and 98% respectively immediate post- program, and to 36%, 66%, and 60% respectively after three months post- program.

Moreover, regarding the steps of: put on sterile gloves, clean the wound from top to bottom and from the Centre to the outside, following this pattern, use new gauze for each wipe, and once the wound is cleaned, dry the area using a gauze sponge in the same manner. only 8%, 16%, 8%, and 10% respectively of the studied nurses correctly practice these steps pre-program. However, these percentages improved to 92%, 100%, 100%, and 100% respectively immediate post- program phase, and to 76%, 90%, 78%, and 78% respectively after three months post- program.

Table (4C): Wound care practice among the studied nurses(N=50):

Wound care practice	Pre- program				Immediate post-program				follow up after 3 months			
	Yes		No		Yes		No		Yes		No	
	No	%	No	%	No	%	No	%	No	%	No	%
Post procedure care:												
29. Remove gloves.	42	84	8	16	49	98	1	2	47	94	3	6
30. Apply tape or compression to secure the dressing.	49	98	1	2	50	100	0	0	49	98	1	2
31. Label dressing with date and time after securing the dressing.	3	6	47	94	40	80	10	20	6	12	44	88
32. Remove all remaining equipment.	48	96	2	4	50	100	0	0	48	96	2	4
33. Place the patient in comfortable position and bed in the lowest position.	21	42	29	58	49	98	1	2	30	60	20	40
34. Perform hand hygiene.	50	100	0	0	50	100	0	0	50	100	0	0
35. Note and document any abnormal observations	7	14	43	86	46	92	4	8	32	64	18	36

Table (4C):illustrates that the least percentage of the studied nurses reported correct answers in the following steps pre-program: after securing the dressing, label dressing with date and time 6%, and note and document any abnormal observations 14%. However, the nurses' responses improved post- program immediately 94%, and 92% respectively, and 12%, and 64% respectively after three months post- program.

Table (5): Total wound care practice scores among the studied nurses (N=50):

Total wound care practice	Pre- program		Immediate post- program		follow up after 3 months		Test of Sig (X ²) P- value
	No	%	No	%	No	%	
Satisfactory	7	14	50	100	50	100	X ² = 120.561 P= .000*
Unsatisfactory	43	86	0	0	0	0	

X² = Chi square test

*Sig. the p- value for test ≤ 0.05

Table (5): shows that, all of the studied nurses had satisfactory wound care practice immediate post- and follow up 3 months post the program implementation comparing to 14 % of them pre-program implementation with statistically significant differences whereas $p \leq 0.05$.

Table(6):Correlation between knowledge and practice among the studied nurses (pre, immediate and 3 months after implementing program). (N=50)

Items	Person Correlation					
	Nurses' knowledge					
	Pre-program		Immediate post program		follow up after 3 months	
	Coefficient (r)	P- value	Coefficient (r)	P- value	Coefficient (r)	P- value
Nurses' practice Pre-program	.589**	.000	.172	.233	-.020	.892
Nurses' practice Immediate post program	.131	.365	.474**	.001	.223	.119
Nurses' practice (3 months) post-program	-.115	.425	.140	.333	.322*	.022

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

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

Table (6): illustrates that, there was a positive significant correlation between nurses' knowledge regarding venous leg ulcer care and their wound care practice at pre-program implementation, while there were a negative correlation between nurses' practice Pre-program and nurses' knowledge after 3 months post program implementation. Moreover, there was a positive significant correlation between nurses' knowledge regarding venous leg ulcer care and their wound care practice immediate post-program

implementation, and there was a significant correlation between nurses' knowledge regarding venous leg ulcer care and their practice after three months post-program implementation.

Discussion

The present study indicates that the females nurses were more prevalent than male nurses, concerning to their age, about half of them their age ranged from 20 to 30 years old. Concerning years of experience, more than two fifths of the studied nurses have 5 to < 10 years of experience. However, more than one third of the studied nurses have 5 to <10 years and ≥ 10 years of experience in surgical department. Additionally, more than half of nurses participated in the present study have a secondary nursing education, while two fifths of them have a technical nursing education. Otherwise, more than three quarters of nurses in the present study were married.

On the other hand, the present study revealed that more than half of the studied nurses before program had unsatisfactory knowledge regarding venous leg ulcer care; this might be related to the absence of staff developmental activities such as attending lectures or conferences to refresh knowledge regarding venous leg ulcer care. In addition, it might due to lack of appropriate studied courses. However, nurses' knowledge becomes satisfactory post implementation of the educational program regarding venous leg ulcer care, and during follow up.

These results go in the same line with those of (Pirani, 2020) who reported that nurses' knowledge scores regarding wound care were unsatisfactory. However, the studied nurses' knowledge increased significantly immediately after implementing the program regarding wound care.

Moreover, regarding the nurses' knowledge about venous leg ulcer in the present study, more than half of them had unsatisfactory knowledge about venous leg ulcer before the implementation of the program, however, this mean increased immediately after the program implementation and during the follow- up after three months. From the researcher perspective, nurses do not realize the importance of understanding the etiology behind the wound that affect the risk of getting a wound and healing.

Regarding the nurses' knowledge about venous leg ulcer care, the present study showed that more than half of them had unsatisfactory knowledge pre- program, but this mean increased immediately post-program and also continued during the follow- up after three months post- program implementation. Moreover, the mean score of venous leg ulcer healing knowledge was lower before the implementation of the program compared with this mean at post- program implementation and during the follow- up phases was significantly higher.

Furthermore, more than half of the nurses had unsatisfactory knowledge regarding the complications of venous leg ulcer before the implementation of the program. This changed to satisfactory knowledge after the program implementation directly and during the follow- up after three months. This might be due to the nurses' failure to recognize the stages of healing may have led to nurses' poor differentiation between infected and healing ulcers.

The current study highlighted that the knowledge of more than half of the studied nurses regarding infection control measures and universal precaution during wound care, before the implementation of the program, was satisfactory. However, this percentage increased immediately after program implementation and during follow-up after three months. From the research point of view, these findings may have been due to that not all nurses attended training related to infection control measures.

This result disagree with (Osman et al., 2021) who mentioned that the effects of the educational interventions on nurses overall level of knowledge, as nearly two third of them had "poor" level of knowledge related to infection control practices before application of the nursing interventions, compared to the majority who achieved "high" level of knowledge post program implementation.

In addition to that, dressing is a part of a holistic wound management plan with individualized patient goals. One goal of wound care may be to facilitate faster wound healing by providing the optimal environment for healing to proceed. As result yielded by the current study, most of studied nurses showed unsatisfactory wound care practices pre-program implementation, whereas the most of nurses had satisfactory practice in post- program phase and during follow-up. This may be due to deficit of their knowledge and the lack of policies and procedures, equipment and supplies, the high workload and shortage in nurses, which led to poor quality of patient care.

Moreover, this result is in accordance with (Pirani, 2020) who reported that nurses' wound care skills scores post program increased when compared to pre-program scores. Furthermore, the results of the present study indicated that most of the studied nurses had unsatisfactory practice regarding venous leg ulcer care pre-program implementation. This goes in the same line with (Yra and Walsh, 2016) who reported that the declining nurses' practice might be due to the lack of knowledge about the importance of infection control measures during dressing, as hand washing before/after dressing and wearing a sterile glove before dressing. On the other hand, these results improved post- program implementation.

These results might reflect the defects of wound care practice, especially while using the aseptic technique for wound cleaning and in items related to hand washing and compliance with protective measures during wound dressing. From the researcher point of view, this might be related to Poor working conditions were exacerbated by heavy workloads and a lack of nursing personnedue to Nurse-to-patient ratios were low, and nursing participants did not have the time to perform and complete all tasks especially during covid-19 pandemic.

The result of the current study is consistent with (Timmins et al., 2018) who revealed that dressing performed by nurses had a number of areas were needing improvement such as hand hygiene, the use of aseptic techniques, patient education (explain the procedure to the patient), pain assessment (and treatment) and documentation related to wound assessment.

Regarding Personal protective equipment(PPE) , the present study findings revealed that the majority of the studied nurses' level of practice was "poor" before interventions, whereas all nurses achieved "good" level of practice after interventions. This might be related tonon-availability of PPE and

workload probably does not give nurses time to use PPE; nurses may feel discomfort with PPE. This lie in line with (Mukhtad et al., 2019&Elsaidy et al., 2019) who reported that nurses' use of PPE was "unsatisfactory". The present study findings, disagree with the study of (Med et al., 2020), who reported higher level of compliance of nurses, using PPE.

Additionally, regarding preparation and assessment steps of the wound dressing, study nurses had a low practiced especially items related to infection control like hand washing and wearing PPE. This result may be related to the lack of training or workshop about infection control practice and policy of the hospitals relating improving quality of their care. This result agrees with the results of (Najm and Hussein, 2018) which found that wound preparation was a low regarding practice especially hand washing and wearing gloves.

Moreover, the result of the present study showed that most of studied nurses do not use a waterproof bad under the wound site. This result goes in the same line with (Khudhair, 2018) which found that nurses had inadequate practice for item applying clean drape sheets under patient's site of dressing.

Nurses undertaking an aseptic procedure should be aware of the infection prevention and control precautions required, and the risks associated with poor technique (National Institute for Health and Care Excellence, 2017). Poor technique can lead to the transfer of transient organisms that live on the skin, which may lead to a localized or systemic infection (Denton and Hallam, 2020).Therefore, the nurse needs to recognize the importance of the strict aseptic principles to minimize the spread of infection.

The results of the present study revealed that most of the studied nurses had unsatisfactory practice related to many items of dressing technique, especially hand washing, using aseptic technique during cleaning wound, and compliance with protective barriers e.g. gloves and face masks during dressing. These might be due to the nurses' underestimation of the importance of infection control during dressing, the lower awareness of these nurses about duties, powers, and responsibilities and their regular participation in in-ward trainings, as none of them had any courses or training related to infection control or wound care.

These finding were in accordance with (Kielo et al., 2018) which illustrate that a previous literature review has shown that nurses and graduating student nurses have limited competence related wound care.

Recently (Hamawandi and Ahamad, 2021), emphasized that nurses must assess the wound dressing for amount, consistency and color of drainage and record types of used cleansing solution, antiseptic solution/ointment and dressing applied recorded in nursing sheet because some of the physicians when daily come to visit patient, they opened dressing again to see the condition and the character of wound.

The current study represented that the studied nurses had improvement in practice immediately after the program implementation and in follow- up compared to pre-program implementation regarding wound assessment and observation. From the researcher perspective, this might be related to the lack of information about the importance of wound assessment and the role of this in wound healing and limiting wound infection.

In general, the results of the present study revealed that the levels of nurses' knowledge and practice regarding venous leg ulcer care have improved immediately after implementing the educational program. These results agreed with those of (Bondi et al., 2020) who found that the levels of knowledge and practice have tremendously improved after the educational intervention related to wound care management, which suggests that the educational intervention module was effective and could be further expanded to the other health facilities.

On the other hand, the improvement of nurses' practice after three months post-program implementation is less than their improvement immediately post program. From the point view of the researcher, the studied nurses are practice wound dressing daily but they do not follow the ideal steps of wound care checklist.

The current study indicated that there was a significant correlation between nurses' knowledge regarding venous leg ulcer care and their practice at pre-program phase. In other words, the lack of knowledge about VLU means that patients may not receive adequate wound care. These findings were in disagreement with (Lobo, Sams & Fernandez, 2019) which mentioned that there was a linear correlation between nurses' knowledge and practice suggests knowledge does not always translate into good practice.

Moreover, there was a significant correlation between nurses in immediate post-program or follow-up phases and their knowledge and practice about venous leg ulcer care. This may have been due to that all studied nurses had diploma degree and most of them did not have any training or knowledge regarding venous leg ulcer care.

Conclusion

The conclusion of this study was nurses attending the educational program regarding venous leg ulcer care showed improved levels of knowledge and practice.

Recommendation

Given the most important study findings, the following recommendations are suggested: Nurses' knowledge and practice about wound care, and infection control in general, needs to be updated through in-service training program. The training received by nurses should be assessed at regular intervals and should be used as part of their professional development.

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