Training of Nurses on Rehabilitation of Patients with Spinal Cord Injuries

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Abstract

Nursing activities and caring should be superior in spinal cord injury rehabilitation, in order to teach care to the family and the patient, nurses should have enhanced knowledge and skills about spinal cord injury and prevention of complications. **The aim of the study** was to evaluate the effect of a training program for nurses on rehabilitation of clients with spinal cord injuries. **Design:** A quasi-experimental study design. **Setting:** The study was conducted at the Physical Medicine and Rehabilitation and Rheumatology Center. **Sample:** A purposive sample, it targeted all rehabilitation nurses in the studied center, with total number was 100 nurses. **Tools:** Data were collected by using two tools: I- a structural Questionnaire to collect data about demographic characteristics of the studied nurses, II- knowledge regarding Rehabilitation nursing, Spinal cord injuries**,** Dysreflexia and pressure ulcer. The second tool was an observational Checklist: to assess nurses' performance. **Results:** The study findings indicated that; Near two thirds of the studied nurses had a total score satisfactory knowledge regard rehabilitation nursing, increased to 100% after training, the differences observed were statistically significant, meanwhile less than half of nurse's had total satisfactory performance of selected rehabilitation nursing skills pre training was raised to 92% after training the differences observed were statistically significant. **Conclusion:** the study concluded that, training of rehabilitation nurses positively affected their knowledge and performance for caring of patients with statistically significances. **Recommendations:** The study recommended that, planning of continuous and efficient training programs for nurses on rehabilitation nursing skills. Further researches to be carried out to study other approaches to promote rehabilitation nurses care of spinal cord injuries patients such as; sexuality counseling, pain management and muscular exercises.

Key words: spinal cord injuries, rehabilitation nursing.

Introduction

Spinal cord injury (SCIA) is a disturbing and distressing event that influence a patient's physical, psychological, and social well-being **(Singh, 2014).** Every year, around the world, between 250 000 and 500 000 people suffers a spinal cord injury, but unfortunately, the exact number is unknown. The estimated annual global incidence is 40 to 80 cases per million populations **(WHO, 2013).** The highest was in the United States of America (906 per million) and the lowest incidences were in Fiji (10.0 per million) and Spain (8.0 per million). Traffic accidents especially motorcycle were typically the most common cause of SCI, followed by falls in the elderly population **(Singh, 2014).**

Since the spinal cord is the organ responsible for the communication between the brain and other body areas, spinal cord injury interferes in nerve

pathways and can cause serious health complications. People with this type of damage may have a deficit in respiratory, thermal, musculoskeletal, circulatory, and urinary and bowel sphincter functions as well as in sexual activity (**Bauman and McCourt, 2016**). Patients' lived body and life commonly change suddenly, such as self-care became difficult to perform. This can be great challenge to living independent everyday life (**Holmlund,** *et al.,* **20017**),

Nurses, physicians, psychologists, therapists, and nutritionists are interdisciplinary team of rehabilitation that a spinal cord injuries patient relies heavily on. Understanding of care management needed for populations with acute or chronic illnesses and for conditions that causes disability considers one of rehabilitation nurses' unique skills, focusing on helping patients in these vulnerable populations recover as much function as possible or manage new disability (**Camicia** *et al.,* **2014**).

Providing optimum care for patients is an important role for rehabilitation nursing staff in addition to learning patients and family members (caregivers) about the physiologic changes that occur as a finding of a traumatic spinal cord injury (**Reynolds, et al., 2018**). Moreover, information and awareness of such changes should be addressed during the rehabilitation process since rehabilitation nurses usually being to bladder and bowel management of care early in the rehabilitation process (**Rundquist** *et al.,* **2011**).

Association of Rehabilitation Nurses, (2014), recommends that the nurses with this specialty training are utilized to facilitate care for individuals with disabling conditions besides giving facts to families and caregivers on options and services able to be used, moreover, support, and simplify the discharge transition process to promote quality outcomes and cost-effective care for individuals with disabling (**Arif, 2015**).

Significance of the study

In Egypt according to the statics from information center in Ain Shams University (ASU) which stated that, in the year 2004, the number of cases admitted to El demerdash hospital with spinal cord injury account for 4% of all cases admitted to neurosurgery unites (**El Moteleb, 2007**). The rehabilitation nurse provides care, education, and support to the client and family. Care is focused on assisting disabled patients, their families, and their communities, in the development of the client's self-care skills (**Khan,** *et al.,* **2017**).

Aim of the study:

Evaluate the effect of training of nurses on rehabilitation of patients with spinal cord injuries through:

1. Assessing nurses' knowledge and performance to detect their training needs.

2. Designing and implementing rehabilitation-training program for the nurses according to their needs for spinal cord injury patients.

3. Evaluating the nurse's knowledge and performance related to rehabilitation nursing skills of patients with spinal cord injuries.

Research hypothesis:

Training of rehabilitation nurses will positively affect their knowledge and performance for caring of patients with spinal cord injuries.

Subject and Methods

Design: A quasi experimental study design.

Setting:

The present study was carried out in the Physical Medicine and Rehabilitation and Rheumatology Center affiliated to the Armed forces, located in AL-Geza governorate one of the biggest governorate in Egypt; which is located in Al Agoza district. This rehabilitation center established in 1954, on about 60,000 square meters in the western bank of the river Nile, where it includes a factory for artificial limbs and rehabilitation accessories. The studded center includes an outpatient and inpatient with the capacity of 130 inpatient's beds, for rehabilitation health care which is known to be the most advanced centers of the military medical services, providing medicine and rehabilitation services to all military and civilian patients it also includes a special surgical center for spinal cord injuries.

Sample:

A purposive sample, it targeted all rehabilitation nurses in the studied center, with total number is 100 nurses who voluntary accepted to participate in the research after explaining the purpose of the study.

Data collection tools:

Data were collected by the researcher using two tools:

1) The first tool: a structured interviewing Questionnaire to collect data about:

A) Demographic characteristics of the studied nurses such as: age, gender, educational level, previous working experience, years of experience in rehabilitation nursing and previous received training; it was developed by the researcher based on review of recent literature, experts' opinion.

B) Nurse's knowledge regarding:

a. Rehabilitation nursing (meaning and concept, principles, role of the rehabilitation nurse and aims of nursing rehabilitation of spinal cord injured patients) it contained 15 questions, with total score of 15 grades.

b. Spinal cord injuries it included basic Anatomical structure of the spinal cord, the main function of the spinal cord, Spinal cord injuries prevalence, causes and nursing rehabilitation of patients with Spinal cord injuries. It contained 30 questions, with total score of 30 grades.

c. Dysreflexia it included; definition, causes and nursing role in dysreflexia, contained 20 questions, with total score of 20 grades.

C) Pre-post Pieper Pressure Ulcer Knowledge tool: consisted of 47-item to assess nurse's knowledge on pressure ulcer prevention. The 3 categories measured in the Pieper Tool are prevention, staging, and general wound knowledge. The tool was modified to be 40 items and translated by the researcher, validation of the tool was tested. Nurses respond to each of the 40 items by indicating 1 of the 3 following choices: true, false, or do not know. Each correct answer corresponded to one point. For wrong or do not know answers, the score was zero. The total score on the knowledge test was the sum of all correct answers. Total scores less than 75% was considered not satisfactory knowledge and score more than 75% or equals considered satisfactory knowledge **(Pieper and Mott, 1995).**

Scoring system

Each correct answer corresponded to one point. For wrong or do not know answers, the score was zero. The total score on the knowledge was the sum of

all correct answers. Total scores less than 75% was considered not satisfactory knowledge and score more than 75% or equals considered satisfactory knowledge.

The second tool was an observational Checklist: to assess nurses' competency level in conducting basic rehabilitation skills*:* it was developed by the researcher based on review of recent literature, experts' opinion, it included:

A- Communication skills: it included; principles of communication, communication with the patients and communication with the staff, the total score were 20 grades.

B- Patient hygiene, as one of the basic activities of daily living, included; bathing, washing Foot care, Hair, Nail care, Perineal care, Mouth and oral care, the total score was 40 grads.

C- Urinary Catheter Care and Bowel rehabilitation; health education of the client about the aim of bowel management, stages of it, abdominal massage, Removal of stool from lower bowel and rectum, Posture and Ano-rectal stimulation.

D- Transferring patient from bed to the wheelchair and the opposite: with total score were 10 grades.

E- Wound care: it included; wound assessment and stages of the wound, healing process, signs of the infection, the total score were 20 grades.

Scoring system

One grade was given for correct and done completely, zero was given for done incorrectly or not done and total scores less than 75% was considered not satisfactory performance and score more than 75% or equals considered satisfactory performance. Tools were tested for content validity by five experts in the field of community health nursing and medical specialty to ascertain relevance and completeness.

Preparatory phase:

The preparatory phase was carried out. Reviewing of the past and current available literature was done relevant to the various theoretical aspects of the problem by using books, articles, periodicals and magazines.

Pilot study

A Pilot study was done on 10 nurses, to examine and test applicability of the study tools and test the suitability and feasibility of the setting, availability of the study population (nurses) the researcher found that, the observational checklist for nurses was full filled in about 20 minutes for each skill for each nurse. Modification of the tools was done based on the findings of the pilot study. Some questions and items were omitted, added, or rephrased, and then the final form was developed, the subjects included in the pilot study were excluded from the study sample. The instrument was distributed to participants during working hours. Participants' nurses answered individually and returned the test to the researcher immediately.

Ethical Considerations:

Each nurse was informed about the purpose and the benefits of the study then oral consent was obtained before starting data collection. Strict confidentiality was ensured through the study process with their right to refuse or withdraw at any time with no consequences.

Fieldwork:

After official permission to carry out the study, the researcher interviewed the nurses and distributed the interviewed questionnaires after explaining the aim of the research.

Data collection for this study were carried out within a period of six months;

the actual field work was carried out from the beginning of June 2017, to January 2018. According to a time scheduled for nurses two days/week, after taking their oral agreement.

Training program constructions through 3 phases:

The first phase: Pre assessment phase; where the pretest questions were given to the nurses and assessment of the nurses' performance through observation.

The second phase: Planning and implementation phases; the training program was developed with the general objective to improve the nurses knowledge and performance regards spinal cord injuries rehabilitation, the content was revised and modified according to the related literature. It consisted of detailed knowledge about spinal cord injuries such as rehabilitation nursing (meaning and concept, principles, the role of the rehabilitation nurse and aims of nursing rehabilitation of spinal cord injured patients). Knowledge about spinal cord injuries (basic anatomical structure of the spinal cord, the main function of the spinal cord, Spinal cord injuries. knowledge about Dysreflexia (definition, causes and nursing role in dysreflexia). competency level in

conducting basic rehabilitation skills: it was developed, and contained; (communication with the patients and communication with the staff), patient hygiene (bathing, washing Foot care, Hair, Nail care, Perineal care, Mouth and oral care), urinary Catheter Care and Bowel rehabilitation (aim of bowel management, stages of it, abdominal massage. Removal of stool from lower bowel and rectum, Posture and Ano-rectal stimulation), transferring patient from bed to the wheelchair and the opposite, Wound care (wound assessment and stages of the wound, healing process, signs of the infection).

The third phase: it was for evaluation phases, achieved by reassessment of the nurses of the rehabilitation nurses knowledge and performance by using the same preprogram format. It started after one week of their last training session.

Statistical Design:

Data analysis: data were statistically analyzed using the SPSS computer program. Description of qualitative variables was done in the form of frequency and percentage and for quantitative variables as mean and standard deviations. Differences between variables were done using chi square.

Results:

Table (1): Distribution of Nurses According to their Characteristics **(no=100).**

Socio-Demographic Data	No	%
Age in years:		
• 20yrs-	55	55%
• 30yrs -	37	37%
• Above 40	8	8%
Mean age/year ±SD	28.71±6.8yrs	
Education:		
• Nursing School Diploma	63	63%
• Technical Nursing Institute	36	36%
• Faculty of Nursing	1	1%
Previous received training:		
• Yes	41	41%
Years of experience in general Nursing:		
• 1 to < 8 yrs.	61	61%
• 8 to < 16 yrs.	31	31%
• 16 to < 24 yrs.	1	8%
Mean/years ±SD	7.6 ±5.14yrs	
Years of experience in Rehabilitation Nursing:		
• 1 to < 6 yrs.	71	71%
• 6 to < 11 yrs.	22	22%
• 11 to <19 yrs.	7	7%
Mean/years ±SD	4.6 ±3.81yrs	

Table (1): showed that, the mean age of the studied nurses was 28.71±6.8years, 55% of them their age was under 30 years and 8% were above 40 yrs. Regarding the educational level, 63% of the studied nurses were diploma nurses, and 36% of them graduated from technical nursing institute. Concerning the previous received training, it was found that, 59% of the studied nurses did not receive previous training. Meanwhile, 63 % of them had between one to six years of experience in general nursing and 71% of the studied nurses have between one to six years of experience in rehabilitation nursing.

Table (2): Distribution of the Nurses According to their knowledge about rehabilitation nursing of Patients with spinal cord injuries pre and post training **(no=100).**

Nurse's knowledge regard:	Pre-training Satisfactory %	Post -training Satisfactory %	$1X^2$	P Value
Basic Knowledge of Rehabilitation nursing.	87%	98%	8.72	< 0.01
Anatomy and function of Spinal Cord	71.0%	92%	14.62	< 0.001**
Dysreflexia	77%	97%	17.86	<0.001
Stages of pressure ulcer	83%	97%	10.89	< 0.001
Prevention of pressure ulcer	83%	96%	8.99	< 0.01

Table (2): indicated the significant difference between studied nurses knowledge about rehabilitation nursing of spinal cord injure patients pre and post training; where 87% of the studied nurses had satisfactory knowledge as regard Rehabilitation Nursing (definition, concept, principles of Rehabilitation Nursing, role of the rehabilitation nurse and aims of nursing rehabilitation of spinal cord injured patients) in Pre-training, this percentage increased to 98% after training this improvement was statistically significant difference ($1X^2$ = 8.72, P = 0.01). Meanwhile, 71% of the studied nurses had satisfactory knowledge score level as regards anatomy and function of the Spinal Cord in Pre-training assessment, raised to 92% after training the differences observed were statistically significant ($1X^2$ = 14.62 at P = 0.001).

Moreover, pre training total satisfactory score knowledge of nurses as regards Dysreflexia (definition, causes and nursing role) was 77%, which increased to 97% after training, improvement in nurses' knowledge were highly statically significant ($1X^2$ =17.86, P < 0.001).

Concerning stages of pressure ulcers, the results showed that, 83% of the studied nurses had a satisfactory knowledge score level in the pre-training assessment, increased to 97% after training the differences observed were statistically significant ($1X^2$ = 10.89, P < 0.001). In relation to the prevention of pressure ulcer knowledge, 83% of the studied nurses had a satisfactory knowledge score level in Pre-training assessment, increased to 96% after training the differences observed were statistically significant (($1X^2$ = 8.99, P < 0.01).

Table (3): Distribution of the Nurses According to their performances of selected care for Patients with spinal cord injuries pre and post training **(no= 100)**

Observed Nurse's Performance of:	Satisfactory Performance		$1 X^2$	P Value
	Pre-training	Post -training		
	%	%		
Communication skills	74%	95%	16.84	<0.001
Patient hygiene	72%	97%	23.86	<0.001
Urinary catheter Care and Bowel rehabilitation	66%	92%	20.37	<0.001
Transferring the patient from the bed to chair and the opposite	61%	94%	31.23	<0.001
Wound care of pressure ulcer	90%	96%	2.76	P > 0.5

Table (3): revealed, 74% of the studied nurses had satisfactory performance score level regarding communication skills in Pre-training assessment, increased to 95% after training the differences observed were statistically highly significant ($1X^2$ =16.84, at P= 0.001). Meanwhile, 72% of the studied nurses' total performance score level of patients 'hygiene (includes, bathing, and washing Foot care, Hair, Nail care , erineal care, Mouth and oral care) were performed correctly in Pre-training assessment, increased to 97% after training the differences observed were statistically highly significant ($1X^2$ = 23.86 P < 0.001).

By comparing total satisfactory performance score level of urinary catheter care and bowel rehabilitation pre and post training, Table 3 also revealed that, 66% of the studied nurses their performance was satisfactory in Pre-training assessment, increased to 92% after training the difference in improvement was statistically significant ($1X^2$ = 20.37 with P value < 0.001). Meanwhile 61% of the studied nurses' performance score level of Patients' Transfer from bed to chair and the opposite done correctly in Pre-training assessment, raised

to 94% after training the differences observed were statistically highly significant ($1X^2 =$ 31.23 P < 0.001).This table also revealed that, 90% of the studies nurses' total performance score level of wound care of pressure ulcer was performed correctly in Pre-training assessment, raised to 96% after training this difference in improvement was not statistically significant ($1X^2 = 2.76$, P > 0.5).

Figure (1): Distribution of the Nurses According to their total satisfactory knowledge of nursing rehabilitation of Patients with spinal cord injuries pre and post training **(no=100).**
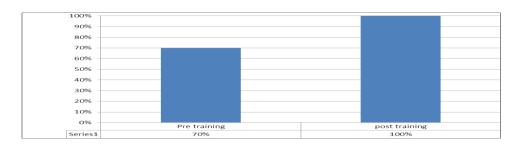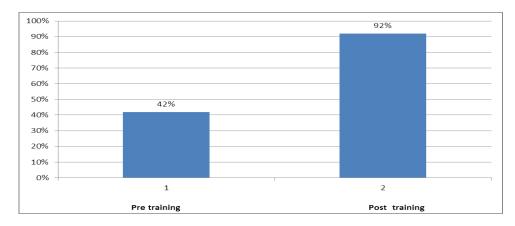

Figure (1): Illustrated that, in pre-training, 70% of the studied nurses had a total satisfactory knowledge regard rehabilitation nursing of Patients with spinal cord injuries, increased to 100% after training, the differences observed were statistically highly significant ($1X^2 = 35.3$ P < 0.001).

Figure 2: Distribution of the Nurses According to their total satisfactory performance of selected rehabilitation nursing skills of Patients with spinal cord injuries pre and post training (no=100).

Table (4): Distribution of Nurse's Pre-Post Training total Knowledge and Nurse's Socio-Demographic Data **(no=100).**

Nurse's Socio-Demographic Data	Nurse's Total satisfactory Knowledge (No=100)		$1 X^2$	P Value
	Pre Program	Post program		
	%	%		
I- Nurse's age:				
• 20:29	29	55		
• 30:40	35	39	3.07	
• Over 41	6	6		P > 0.5
II- Nurse's Level Of Education:				
• School nurses	38	63	1.31	
• Technical institute nurses	31	36		
• Faculty nurses	1	1		P > 0.5
III- Years of experience in Rehabilitation Nursing:			0.55	
• 1 to < 6 yrs.	46	71		
• 6 to < 11 yrs.	17	21		
• 11 to <19 yrs.	7	8		P > 0.5

Table (5): Distribution of Nurse's Pre-Post Training total Performance and Nurse's Socio-Demographic Data **(no=100).**

Nurse's Socio-Demographic Data	Nurse's Total satisfactory Performance Done correctly (No=100)		$1 X^2$	P Value
	Pre Program	Post Program		
	%	%		
I- Nurse's age:				
• 20:29	16	48		
• 30:40	26	37		
• Over 41	1	6	4.93	P > 0.5
II- Nurse's Level of Education:				
• School nurses	22	55		
• Technical institute nurses	20	35		
• Faculty nurses	1	1	1.19	P > 0.5
III- Years of experience in Rehabilitation Nursing:				
• 1 to < 6 yrs.	28	64		
• 6 to < 11 yrs.	9	19		
• 11 to <19 yrs.	6	8	0.86	P > 0.5

Discussion:

Training of nurses serves to update the staff's occupational knowledge, professional skills and improve the best practices for fulfilling various tasks and responsibilities, contributing to greater efficiency of the staff and organizations; it plays a

necessary role for better quality of care **(Chaghari *et al.,* 2017).**

According to **Association of Rehabilitation Nurses, (2014),** nurses work in a team in the rehabilitation process playing role of caregiver, teacher, and case director, a person trained to give guidance on personal, and advocate, coordinator of care, so educational interventions are needed to advance nursing practice especially in the setting of rehabilitation care unites which provides long-term contact with patients and nurses.

According to The socio-demographic characteristics of the studied nurses, the finding showed that, more than half of them their age was under 30 years; the mean age of nurses was 28.71SD±6.8yrs, about two thirds of them were a diploma nurses and about one third of them were working in the rehabilitation nursing filed for more than eight years with mean years was 4.6 SD±3.81yrs, this study revealed that, more than half of the studied nurses did not received any previous training regard rehabilitation nursing (**table 1**). This finding agreed with **Qtait, and Sayej (2016)** in a quantitative descriptive study to investigate the level of nursing performance and the factors affect nursing performance in Hebron hospitals, on 181 nurses working in Hebron district Hospitals in the West Bank Palestine they find that, The majority of the nurses were with age less than 39 years old, with less than ten years of experience, but 60% of them had a bachelor degree.

According to the research hypothesis concerning nurse's knowledge about principles of basic knowledge of rehabilitation nursing, the current study found that, the nurse's knowledge score improved after implementing of the training. This change was with highly statistically significant differences in pre and post training and in total nurse's

knowledge (Table 2). This result supported by **Mauk (2013),** in a project involved 16 rehabilitation nurses in Spain through pre- and posttests, showed a significant increase from pre-training to pos- training in the competencies of the nurses. This finding supported the expectation that, rehabilitation nursing is a specialty with its own unique knowledge. This finding agreed with **Mauk et al., (2017),** in a study to educate Chinese nurses about rehabilitation nursing, they concluded that, knowledge of the nurses on topics of basic rehabilitation nursing increased as a result of the educational program with statistically significances.

The current study found that, the unsatisfactory nurse's knowledge regarding anatomy and function of spinal cord in pre training improved after implementing of the training. These improvements were highly statistically significant difference in pre and post training (Table 2). According to **Napier, (2009)** nurses need to understand how the body works, so that, they can understand what happens when it is ill or injured, and what nurses can do about it.

The results of the present study revealed that, there were highly statistically significant differences between pre and post training of nurse's knowledge as regard Dysreflexia (definition, causes and nursing role) (Table 2). This result was in agreement with **Mauk, (2013)** in a study to describe educational intervention modules on 16 rehabilitation nurses who found that, nurses' knowledge were unsatisfactory as regard autonomic dysreflexia, in pretest which increased in posttests with significant statistical improvement, and explained the lack of knowledge in pre training, was not surprising as autonomic dysreflexia represent the topic of more unique knowledge in rehabilitation. The results also supported by **Tofieq *et al.,* (2007),** in a study to assess the knowledge

and practices for 100 nurses, that, working in words of Ibn Al-kuff hospital, about the autonomic dysreflexia syndrome in the spinal cord patients, who find that, the majority of the nurses had poor knowledge about dysreflexia. This finding was in accordance with **Feyzi et al., (2011),** in a descriptive-analytical study performed in Tehran military hospitals, on 94 nurses to evaluate nurses' knowledge level about autonomic dysreflexia among nurses working in spinal cord injury departments, who find that, nurses had a poor level of knowledge about autonomic dysreflexia and its complications. They explained that, autonomic dysreflexia is a fatal and serious medical problem, which can occur in a person with spinal cord injury. Health care providers must be aware of this problem and be able to interfere early avoiding the severity and complications of this problem, with enough nurses' awareness of autonomic dysreflexia, they can identify the underlying factors which lead to its occurrence and prevent the spinal cord injured patients from autonomic dysreflexia.

This study finding showed that, unsatisfactory nurse's knowledge concerning stages and prevention of pressure ulcer in pre training improved after implementing of the training; this improvement were highly statistically significance difference in pre and post training (Table 2). This finding were in agreement with **Nuru et al., (2015),** in a cross-sectional survey that was conducted among 248 nurses in Gondar University hospital to assess knowledge and practice of nurses towards prevention of pressure ulcer, who found that, knowledge and practice of the nurses regarding prevention of pressure ulcer was found to be inadequate; they added that, prevention of pressure ulcers is an indicator of quality of care where it is a major nurse-sensitive outcome.

Moreover, this results was consistent with (**Gupta et al., 2012),** on

prospective survey to compare knowledge of pressure ulcer assessment prevention and management in patients with spinal cord injury among nursing staff working in two metropolitan spinal units and rehabilitation they found that, the satisfactory knowledge was 79% and 71% from the two spinal cord injury units, poorer in management. The present study agreed also with **Demarre et al., (2012),** in a cross-sectional study to assess knowledge and attitudes of 553 Belgian nurses on pressure ulcer prevention in Belgian Hospitals who found that, nurses who attended additional training on pressure ulcer prevention showed higher knowledge scores than nurses who did not received any in service training.

This study result contradicted with **Hulsenboom et al., (2007),** in a cross-sectional study design among nurses employed in a Dutch hospitals to camper their knowledge and differences in knowledge between nurses in Dutch hospital about preventive measures of pressure ulcer and the usefulness of preventive measures between 1991 and 2003, who stated that, participants' knowledge barely improved in the previous decade. Poor nurses knowledge, this might be due to many factors related to content included in nurse's curriculums which might not meets the educational needs of the nurses or lack of learning resources for nurses to upgrade their knowledge would be another cause for poor level of nurse's knowledge

Concerning satisfactory nurses' performance score level regarding communication skills, this research results showed that, there were highly statistically significant difference between pre and post training of nurse's performance (Table 3). This results were in agreement with **Khodadadi et al., (2013)**, in an experimental study on 73 nurses, in Tabriz hospitals; one of their aims was to evaluate the impact of communication skills training on communication skills of nurses they

found that, the training of communication skills can improve the nurse's performance of communication skills, they added that, nurses should learn the necessary skills for establishing a relationship with patients and other medical team members. The results of the present study supported by **Steckler, (2012),** in a study to assess the improving of communication skills among nursing students in college of nursing, who emphasized that, communication skills training will likely continue to be an important part of training for nursing.

The current study findings reveled that, the total score of unsatisfactory nurse's knowledge regarding hygiene (includes, bathing, and washing foot care, hair, nail care, perineal care, mouth and oral care) in pre training improved after implementing of the training. This improvement was highly statistically significant difference in pre and post training (Table 3). The results of the current study were in the same line with **El-Soussi and Asfour, (2017),** in a descriptive study to identify the level of nurses' practice and knowledge about interventional patient hygiene in critical care units in a hospital in Egypt; they found that, the mean percentage of interventional patient hygiene knowledge score is higher than the mean percentage interventional patient hygiene practice score. The study findings also agreed with **El-Soussi and Asfour (2016),** in a descriptive study in sixty intensive care unit nurses in Egypt, to examining bed-bath practices of critically ill patients they found that, more than three quarters of nurses, 79% had improper bed-bath practices.

As regards satisfactory nurse's performance score level regarding urinary catheter care and bowel rehabilitation, there was a highly statistically significant difference between pre and post training of nurse's performance (Table 3). This result agreed with **Reynolds *et al.,***

(2018), in a study to implement a spinal cord injury program to examine neuro-critical care nurses' knowledge of spinal cord injury they found that, the implementation program improved nurses' knowledge, and ensured that, bowel rehabilitation and bladder elimination were ranked as the top two nurse-influence results by experienced rehabilitation nurse in spinal cord injury patients. The present study finding was also supported by **Mauk, (2013),** in a study to describe an evidence based educational intervention provided to 16 rehabilitation nurses working on a new inpatient unit; who found that, a significant increase from pretest to posttest after applying an educational program mostly highly in the pre- and post - tests for the bowel and bladder rehabilitation, The pretest scores for this competency were higher, he added that, nurses need to be educated in the basic competencies of rehabilitation to provide safe, quality care to patients with chronic illnesses and disabilities.

The current study findings revealed that, the total score of unsatisfactory nurse's knowledge regarding patients' transfer from bed to chair and the opposite in pre training improved after implementing of the training. This improvement was highly statistically significant difference in pre and post training (Table 3). This finding agree with **Nelson *et al., (*2007),** in a study done in nursing schools in the United States, to translate research related to safe patient handling into the curriculum they found that, nurses' pre-post training knowledge improved significantly after training. This is might be because of transferring and movement activities are a necessary part of basic nursing care as most rehabilitation nurses will transfer several patients from their bed to a chair or wheelchair every morning, it is one of the most common procedures nurses perform.

The current study findings revealed that, the total score of unsatisfactory nurse's performance regarding wound care of pressure ulcer in pre training improved after implementing of the training. This improvement was no statistically significant different in pre and post training, 90% of the nurses had satisfactory performance level pre training (Table 3). This might be because nurses consider wound care is one of their most specialties. This findings were in agreement with **Mccluskey and Mccarthy (2012),** in their descriptive study on 150 nurses in an acute general hospital in Ireland, To explore nurses' knowledge and performance in wound assessment and management their findings indicated that, knowledge of the nurses regard wound assessment and practice were satisfied. This study findings was contradicting with **Mohamed and Weheida (2015),** in a quasi-experimental study on 40 nurses working in the critical care units at Mansoura University Hospital, to determine effects of implementing educational program about pressure ulcer prevention on nurses' knowledge and practice who found that, (62.5%) of the studied subjects their practice and performance regarding pressure ulcer wound care was un satisfactory which decreased post training were 10%. This result was consistent with the findings of **Hadley and Roques (2007),** in a study of nurse's practice of pressure ulcer in Bangladesh, they found improvement of pressure ulcer related practice after nurses participation in an educational program, they reported that, certain factors as, shortage of nursing staff or limited time of patients care may explain the unsatisfactory level of practice.

The current study findings revealed that, the total satisfactory knowledge regarding selected rehabilitation nursing care of patients with spinal cord injuries in pre training improved after implementing of the training. These improvements were highly statistically significant difference in pre and post training (Figure 1). This result was consistent with **Camicia et al., (2014),** who explained that nurses with rehabilitation nursing training, information, and experience is the healthcare professional the best able to perform rehabilitation nursing tasks for care of individuals with disabling conditions.

The current study findings revealed that, the total satisfactory performance regard rehabilitation nursing skills for patients with spinal cord injuries in pre training improved after implementing of the training. This improvement was highly statistically significant differences in pre and post training (Figure 2). Also, **Mauk (2013)** confirmed that, it is better for nurses to acquired additional knowledge that they need through specific study than time spent working on a rehabilitation unit which considered an effective way for education to increase the knowledge of staff nurses about basic rehabilitation competencies.

Finally, as shown in the literature, staff education have a positive effect on nurses in several areas including spinal cord injuries patients to understand their condition and acquire the skills necessary for functioning after discharge from rehabilitation, perceived competency, and increased quality of patient care (**Aiken et al., 2011, Bailey et al., 2012,** and **Gallagher, 2007).**

The current study findings raveled that, by comparing nurse's knowledge about rehabilitation nursing of spinal cord injury patients pre- post training and nurse's socio-demographic data; there were no significant statistical difference among nurse's socio-demographic data and nurse's knowledge about rehabilitation nursing of spinal cord injury patients pre- post training (table 4). These results were consistent with **Gupta et al., (2012),** on prospective survey to

compare knowledge of pressure ulcer in patients with spinal cord injury among nursing staff working in two metropolitan spinal units and rehabilitation medicine they found that, among nurses, those with more than 10 years of training had the highest average scores with no significant difference in average with no significant difference of nurse's knowledge and years of experience among nurses.

These study results were in accordance with **Kaddourah et al., (2016)** in a cross-sectional study was conducted at the rehabilitation hospital at King Fahad Medical City, Riyadh, Saudi Arabia to assess knowledge and attitudes of health professionals regarding pressure ulcers prevention in an acute rehabilitation Their study revealed that, there was no significant relationship between participants' knowledge scores of pressure ulcers prevention and their education level, or years of clinical experience. In contrast, age and profession had a significant relationship with participant's knowledge of pressure ulcers prevention This finding was in accordance with **Feyzi et al., (2011)**, who found that, there was no significant statistical relationship between the level of education or previous training and nurses' knowledge about autonomic dysreflexia.

The study findings were supported by **Reynolds et al., (2018),** in a study to evaluate a program aimed at improving nurses' knowledge of spinal cord injury guidelines working in neurocritical care unit. There were no significant correlations among pre- post program knowledge and nurse's age, and years of experience as a nurse. Meanwhile; the findings of the current study disagree with the same study of **Reynolds et al., (2018)** regarding experience of nurses in neurocritical care units where there was significant statistical correlation between experience of nurses as a neurocritical care nurse and

the pre-program. Meanwhile, nurses with more neurocritical care experience scored higher in post program knowledge. These negative correlations between nurse's age and experience and post program knowledge indicated that, the younger, less experienced nurses who participated had higher scores on the knowledge assessment for the post program.

This finding was in contradicting with **Nuru et al., (2015), in** a cross-sectional survey conducted on 248 nurses in Gondar University hospital to assess knowledge and performance of nurses towards prevention of pressure ulcer, who found that, there were positive statistical correlations between educational level, knowledge, previous received training and years of experience.

Findings of this study indicated that, there were no statistical significant differences between nurse's total satisfactory performance of rehabilitation nursing skills of spinal cord injured patients pre- post training and nurse's socio-demographic data (table 5). The findings of this study were in agreement with **Qtait and Sayej (2016)** in a quantitative descriptive study investigated nurses' performance and factors affect nursing performance in Hebron hospitals, on 181 nurses working in Hebron district Hospitals in the West Bank Palestine. They found that, there was no significant correlation among gender, level of education, years of experience and nurses' performance.

Conclusion

The study findings and the research hypothesis concluded that, training of rehabilitation nurses led to significant improvement in knowledge and performance of rehabilitation nurses caring of patients with spinal cord injuries.

Recommendations

Based on the findings of this study, the following recommendations were suggested:

a. Creation of continuous, planned and efficient training programs for nurses on rehabilitation nursing skills. This highlights a need for an increased focus on nursing rehabilitation education.

b. Facilitated of Care transitions for individuals with disabling be nurses with rehabilitation nursing training, knowledge, and experience.

c. Further researches recommended to be carried out to study other approaches to promote rehabilitation nurses care concerning spinal cord injuries such patients. As; sexuality counseling, pain management and muscular exercises.

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