

Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators

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Abstract

Background: Mechanical ventilation (MV) is a common procedure and life-saving used to treat patients with respiratory failure. **Aim of the study:** This study aims to evaluate the effect of self-learning package on nurses' performance caring for patients on ventilators. **Subjects and Methods:** **Research Design:** A quasi-experimental study was conducted in critical care units: ICU; RICU and CTICU at Ain-Shams University Hospitals. **Subjects:** A convenient subject of all available nurses caring for patients on MV were recruited for the conduction of this study from the above mentioned setting. **Tools: (1) Self administered questionnaire: Part one** is concerning with demographic data that include (age, gender, educational levels, work area, years of experience, ect..). and **Part two** is concerning with nurses' knowledge regarding caring for patients on MV, **(2) Nurses' performance observational checklists:** It used to assess nurses' practices during caring for patients on MV and **(3) Nurses' opinions questionnaire regarding self-learning package (SLP) and problems facing nurses during management of the patient on MV:** It was used to assess nurses' opinions regarding using SLP and problems & barriers facing nurses. **The results** of this study reveal that, the mean age for nurses under study was 31.38 ± 6.88 . More than two thirds of nurses were females and more than half of them were Diploma nursing graduates. Also, there was statistically significant improvement immediately after SLP implementation and throughout the follow-up phases regarding nurses' performance related to care of patients on ventilators. **Conclusion:** Concluded that there was statistically significant positive effect for SLP on nurses' level of knowledge and practice. **Recommended:** this study recommended conducting the SLP in a wider field including all hospitals to raise the efficiency of nursing care provided.

Key words: Mechanical ventilation, self-learning package and nurse' performance.

Introduction

Mechanical ventilation is the main intervention performed in the treatment of critically ill patients in ICUs. It is a widely used intervention in ICUs, life-saving technological intervention. It is used in the treatment of critically ill patients whose respiratory function is compromised due to an acute or chronic disease. It is a supportive therapy used to assist patients who are unable to maintain adequate oxygenation and/or carbon dioxide elimination. It is a support, non-curative method, with specific indications, and

potential complications (Melo; & Eline, 2014).

Mechanical ventilation is indicated to support patients with acute respiratory failure in situations where the patient has a partial or total airway obstruction, for example following a drug overdose, slow recovery from anesthetic drugs or neuromuscular disorders. Although MV is a life-saving process, it can cause physiological and psychological complications for the patient. An important priority for critical care clinicians is, therefore, to discontinue mechanical

support as soon as possible (Guilhermino; Inder; Sundin; & Kuzmiuk, 2013 and Khalafi; Elahi; & Ahmad, 2016).

Care for the patient with MV has become an integral part of nursing care in critical care units. Nurses must understand each patient's specific pulmonary needs and work together with the physician and respiratory therapist to realistic goals for better outcomes of patient condition. Critical care nurses play an important role in the identification of risk factors and prevention of ventilator-associated pneumonia (VAP) (Smeltzer; Bare; & Hinkle, 2010).

The Self-Learning package as an education program and teaching intervention is effective at increasing the knowledge and practice regarding endotracheal tube, tracheostomy tube & oral suctioning, nurse's practice regarding caring for patients on ventilators in critical care units. Also, it leads to significant improvement in nurse's knowledge and skills about caring for these patients. It is associated with the incidence significantly and increasing improvement the knowledge and practice of these patients (Belal, 2011 and Indira, 2012).

Significance of the study:

MV can save the lives of critically ill patients. It is associated with multiple complications e.g., ventilator-associated pneumonia (VAP) is the most common infections in critical care units. It is associated with significant increases which lead to more length of hospital stay, high costs, morbidity and high mortality. The mortality rate for VAP ranges between 20% and 70%. It is a complex condition not only to diagnose but also to treat, thus prevention is extremely important. The mortality rate for VAP ranges between 20% to 70%. It is a complex condition not only to diagnose but also to treat, thus prevention is very important. The incidence of VAP in Egypt at Ain Shams

University Hospitals ranged from 50 % to 75% (Fathy, et al., 2013 and Zolfaghari; Aeen; Noghabi; & Mehran.2014).

Aim of the study:

This study aims to evaluate the effect of self-learning package on nurses' performance caring for patients on ventilators.

Research hypothesis:

There will be a positive change in nurses' performance post the implementation of self-learning package (SLP) through improvement of nurses' knowledge and practice for caring for patients on ventilators.

Subjects and Methods:

Research Design:

A quasi-experimental design study was utilized to meet the aim of this study.

Setting of the study:

This study was conducted in critical care units: Intensive Care Unit (ICU); Respiratory Intensive Care Unit (RICU) and Cardiothoracic (CTICU) at Ain-Shams University Hospitals.

Research Subjects:

A convenient subject of forty nurses (40) was recruited from the previously mentioned settings for those available nurses 20 from ICU, 10 nurses from RICU and 10 nurses from CTICU from both sexes, different ages and qualifications. **Tools of the study:**

Data pertinent to the study were collected through the following tools:

1. **Self-administered questionnaire:** It was developed by researcher, based

Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators

on reviewing of related literature and consists of the following parts:

Part one: It was concerned with socio-demographic data that include (age, gender, educational levels, work area, years of experience, ect...).

Part two: was concerned with nurses' knowledge regarding caring for patients on mechanical ventilator (78 items) (anatomy & physiology of the respiratory system, mechanical ventilator definitions, indication, purpose, equipments, types, modes, complications, assessment and nursing management, ect..) it will be adapted from **Smeltzer et al.; 2010** and modified by the researcher.

➤ Scoring system

The nurses' questionnaire consisted of 78 questions in the form of multiple choice and true or false questions. (One) a grade was given for each correct answer, and (Zero) for the incorrect answer. The total score of questionnaire was 78 grades.

Evaluation was considered as follow:

- Satisfactory score for knowledge \geq 75% = 59 grades.
- Unsatisfactory score for knowledge $<$ 75%.

2. Nurses' performance observational checklists regarding caring for patients on ventilators (481 items):

It was used to assess nurses' practice in caring for patients on mechanical ventilator regarding applications of following: (hand washing, oral/nasopharyngeal suctioning and Endotracheal tube (ETT) and tracheostomy care, positioning, daily oral care, obtaining arterial blood gases sample, following infection control measures, ventilator circuit change, humidifier change, weaning and documentation) at pre, post and follow

up phases. This tool was quoted from **Bird, et al., 2010; IHI 2014; and Silva; et al., 2013** and modified by the researcher.

➤ Scoring system

The researcher distributed the marks of the procedures according to the steps. (One) a grade was given for each step done correctly and (Zero) was given for each step not done or incorrectly done. The total score of observational checklists was (481) grades.

Evaluation was considered as follow :

- Competent for nurses' practice \geq 75% (360.75) grades.
- In -competent for nurses' practice $<$ 75%.

Self-learning package about nurses' knowledge and practice for caring for patients on ventilators:

It was designed in Arabic language and developed by the researcher based on the results obtained from assessment of the nurses' knowledge and practice, as well as literature review, which included anatomy and physiology of the respiratory system, the overview about MV (definitions, purpose, indication & Settings, types, modes, troubleshooting and alarms, assessment & nursing management, ETT & Tracheostomy, suction, infection control measures & complications, nutrition & medications, weaning from MV and Extubation & Decannulation... ect) and nursing intervention for management of patients on ventilators (oral / nasopharyngeal suctioning, ETT & tracheostomy tube suctioning, care of ETT & tracheostomy tube and positioning, daily oral care, obtaining ABGs, following infection control measures, ventilator circuit change, humidifier change, weaning, and documentation). The designed SLP included the following (booklet -CD).

Reliability and Validity:

Reliability:

Alpha Chronbach test was used to measure the internal consistency of the tool (reliability of the used tool). These showed high-reliability scores for the following tools:

- Nurses' questionnaire = 0.930
- Observational checklist = 0.998
- Nurses` opinionnaire = 0.852

Content validity:

An opinionnaire was developed by the researcher to assess face and content validity of the suggested tools through experts' opinions, which were assessed through a group of seven experts of Medical-Surgical Nursing Specialties.

A- Preparatory phase:

It includes reviewing of literature and theoretical knowledge of the various aspects of this issue using books, articles, net, and magazines, in order to develop the data collection tools.

B- Pilot study:

It was carried out on 10% of nurses fulfilling the selected criteria. This was done to test clarity, arrangement of items and the applicability of the tools. Modifications based on the result of pilot study were made; some statements were omitted, added or rephrased. Nurses who shared in the pilot study were excluded from the main study sample. Finally, the final forms were developed.

C- Field work:

Data collection of this study was accomplished through 19 months, in the period from beginning of the December 2015 to June 2017, during morning and afternoon

shift three days/week. The observation checklist was carried out to assess practice of the nurse caring for patients on ventilators that was filled in by the researcher by direct observation while the questionnaire was carried out to assess knowledge of the nurses caring for patients on ventilators, Both the questionnaire and the observation checklist were carried out before delivering SLP (pre phase), after one month from studying SLP (post phase), and finally after three months (follow up phase).

Ethical considerations

Prior to the conduction of the study, approval was obtained from the Scientific Research Ethical Committee of Faculty of Nursing Ain Shams University. As well, a written consent from participants who were assured that anonymity and confidentiality would be guaranteed and that, they have the right to withdraw from the study at any time without giving any reason. Human rights was considered by explained the aim of the study to each participant to be familiar with importance of his or her participation and assured the nurses that prior data collection and the information obtained confidential and used only for the purpose of the study. The researcher assured that the data collected and information will be treated confidentially by using serial number for every nurse.

Administrative Design:

To carry out the study, the necessary approvals were obtained from the Director and Nursing Director of Ain-Shams University Hospital. Official letters were issued to them from the Faculty of Nursing explaining the aim of the study to obtain permission for collection of data. Written consent was taken from nurses who agreed to participate in the research process. Permission was taken from the administrative personnel and the head nurses/supervisors of critical care units: ICU; RICU and CTICU at Ain-Shams University Hospitals. After the permission was granted to proceed with the study, the head nurse of

Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators

the critical care units was oriented about the objective of the study, to ensure maximum cooperation from the nurses in the study group .

Statistical Design:

The collected data were organized, categorized, tabulated and statistically analyzed using the statistical package for social science (SPSS), version 22, to evaluate the change for nurses under the study (pre and post SLP and after three months. Data were presented in tables and charts using numbers and percentages. The statistical analysis included percentage (%), mean and standard deviation (SD), Paired t-test, Chi-square (X^2), ANOVA test and Pearson coefficient (R). The observed differences, and associations were considered statistically significant at $P < 0.05^*$.

Result

Table (1): Reveals that the mean age for nurses under study was 31.38 ± 6.88 . More than two thirds (72.5%) of the studied nurses were females and more than half (52.5%) of them were diploma nursing graduates. Also three-quarter (75.0%) of the studied nurses were staff nurses, nearly half (47.5%) of them were had experience less than 5 years with mean = 7.65 ± 6.13 . In addition, the majority (85.0%) of the studied nurses didn't attend any training courses about caring for patients on MV.

Figure (1): This figure shows that half (50.0%) of the studied nurses were working in Intensive Care Units (ICU) and one-quarter of them were working in the Respiratory Intensive Care Unit (RICU) and the other quarter working in Cardiothoracic (CTICU).

Table (2): Clarify that, highly statistically significant differences between pre/post and post/follow up phases of the self-learning package (SLP) implementation ($X^2_1=21.0$ and $X^2_3=13.4$ at $P < 0.001^{**}$).

With the total score of pre, post and follow up 30.0%, 82.5%, and 67.5% respectively with a slightly marked decline in follow up phase.

Figure (2): This figure shows the differences association between total satisfactory score of the studied nurses' level of knowledge at pre (30.0%), post (82.5%) & follow up (67.5%) and practice at pre (32.5%), post (80.0%) & follow up (75.0%) phases implementation of self-learning package.

Table (3): This table shows that, 32.5%, 80.0% and 75.0% of the studied nurses had satisfactory total scores of nurses' level of practices regarding caring for patients on ventilators at pre, post and follow up phases respectively with highly statistically significant differences between pre/post and pre/follow up phases of the SLP implementation at ($X^2_1=24.34$ and $X^2_2=20.26$ at $P < 0.001^{**}$). With slightly declining at follow up phase.

Table (4): This table shows that there was a positive correlation between nurses' level of knowledge and their level of practices whenever an increased in nurses' level of knowledge there was an increase in their level of practices.

Table (5): This table shows that there was highly statistically significant relation between total satisfactory nurses' level of knowledge and their demographic characteristics (age, gender, qualifications, years of experience, work area, and categories) pre/post implementation of SLP pre/follow up phase and post/follow up phase at ($p < 0.001$). There was relation between nurses' level of knowledge and their age whenever an increased the age there was an increase in the level of knowledge .

As well, there were statistically significant relations between nurses' level of knowledge and their qualifications whenever an increased in the level of educations there was an increase in the level of knowledge.

Also, there was relation between nurses' level of knowledge and their years of experience whenever an increased years of experience there was an increase in the level of knowledge.

Table (6):This table shows that there was highly statistically significant relation between total satisfactory nurses' level of practices and their demographic characteristics (age, gender, work area and categories) pre/post implementation of SLP pre/follow up phase and post/follow up phase at ($p < 0.001$). There was relation between nurses' level of practices and their age

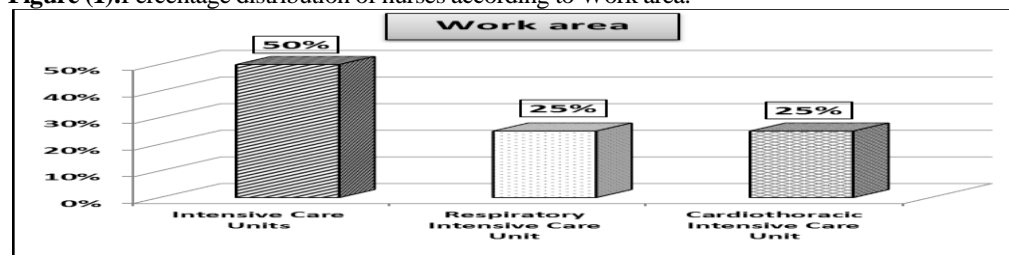
whenever an increased the age there was an increase in the level of practices.

While there were statistically significant differences between the total satisfactory nurses' level of practices and their qualifications, years of experience and previous training courses about MV pre/post implementation of SLP, pre/follow up and post/follow up phase at ($p < 0.05$). There was relation between nurses' level of practices and their qualifications whenever an increased in level of educations there was an increase in the level of practices.

Table (1): Number and percentage distribution of demographic characteristics among nurses under study (n=40).

Items	No	%
Age (years):		
< 20 - < 30	21	52.5
30 - < 40	16	40.0
40 +	3	7.5
Mean ±SD	31.38 ± 6.88	
Sex:		
Male	11	27.5
Female	29	72.5
Marital status:		
Single	15	37.5
Married	25	62.5
Qualifications:		
Diploma nursing	21	52.5
Diploma nursing + specialty	5	12.5
Technical Nursing institute	6	15.0
Bachelor degree	8	20.0
Categories of nurses:		
Nursing supervisor	2	5.0
Head nurse	8	20.0
Staff nurse	30	75.0
Years of experience:		
< 5	19	47.5
5- < 10	10	25.0
10 - 15	3	7.5
+ 15	8	20.0
Mean ±SD	7.65 ± 6.13	
Previous training courses about MV:		
Yes	6	15.0
No	34	85.0

Figure (1):Percentage distribution of nurses according to Work area.



Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators

Table (2):Percentage distribution nurses' knowledge regarding caring for patients on MV pre, post and follow up implementation of SLP (n=40).

Items	Satisfactory						Chi-square					
	Pre n=40		Post n=40		Follow up n=40							
	NO	%	NO	%	NO	%	X ² 1	P-value	X ² 2	P-value	X ² 3	P-value
- Anatomy & physiology of the respiratory system	7	17.5	31	77.5	25	62.5	23.56	<0.000***	13.12	<0.000***	11.08	<0.001**
- MV definitions & Types.	3	7.5	22	55.0	22	55.0	19.00	<0.000***	19.00	<0.000***	18.8	<0.001**
- MV Indication & settings.	12	30.0	35	87.5	32	80.0	21.16	<0.000***	18.18	<0.000***	3.0	< 0.05*
- MV modes.	14	35.0	34	85.0	32	80.0	20.00	<0.000***	14.72	<0.000***	2.0	0.157
- Troubleshooting & alarms of MV.	21	52.5	37	92.5	35	87.5	16.00	<0.001**	12.25	<0.001**	2.0	0.157
- ETT & Tracheostomy.	16	40.0	34	85.0	34	85.0	19.0	<0.001**	18.0	<0.001**	3.0	< 0.05*
- Suction.	10	25.0	33	82.5	33	82.5	23.00	<0.001**	21.00	<0.001**	11.31	<0.001**
- ABGs.	29	72.5	38	95.0	37	92.5	9.00	< 0.05*	6.40	< 0.05	1.80	0.18
- Complications of MV.	23	57.5	33	82.5	32	80.0	6.25	< 0.05*	4.70	< 0.05	1.00	0.317
- Nursing management.	22	55.0	33	82.5	33	82.5	8.06	<0.001**	7.96	<0.001**	1.80	0.18
-Nutrition & medications for patients on MV.	24	60.0	21	52.5	24	60.0	6.05	< 0.05*	4.01	< 0.05*	3.45	< 0.05*
-Weaning from MV &Extubation	19	47.5	33	82.5	33	82.5	13.89	<0.000***	13.12	<0.000***	10.33	<0.001**
Total score	12	30.0	33	82.5	27	67.5	21.0	<0.001**	6.0	<0.05*	13.4	<0.001**

- Not significant P> 0.05 (NS) * Significant P < 0.05 (S) ** Highly significant P < 0.001(HS) *** very highly significant P < 0.000 (VHS)
 - X² 1= pre /post X² 2 = pre /follow up X² 3 = post /follow up

Figure (2):Total satisfactory score of nurses, level of knowledge and practices throughout the implementation of self-learning package phases

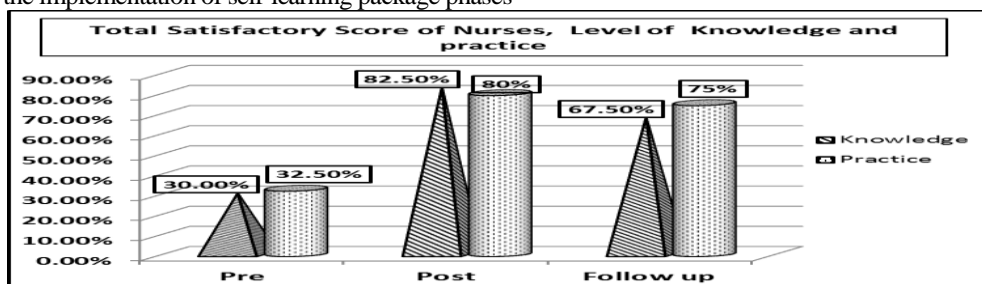


Table (3): Percentage distribution nurses, practice regarding caring for patients on MV pre, post and follow up implementation of SLP (n=40).

Items	Competent						Chi-square					
	Pre n=40		Post n=40		Follow up n=40							
	NO	%	NO	%	NO	%	X ² 1	P-value	X ² 2	P-value	X ² 3	P-value
- Assist with intubation	13	32.5	32	80.0	30	75.0	19.00	<0.000***	17.00	<0.000***	3.0	< 0.05
- Connect ventilator	12	30.0	28	70.0	26	65.0	16.00	<0.000***	14.00	<0.000***	3.0	< 0.05
- Airway Suctioning.	13	32.5	34	85.0	30	75.0	16.00	<0.001**	12.25	<0.001**	2.0	0.157
- Oral Suctioning.	5	12.5	27	67.5	25	62.5	21.00	<0.001**	17.00	<0.001**	4.0	< 0.05
- Nasopharyngeal suction	12	30.0	32	80.0	30	75.0	20.00	<0.001**	18.00	<0.001**	5.31	<0.001**
- ETT or Tracheostomy Tube Suctioning	16	40.0	33	82.5	31	77.5	17.00	<0.000***	13.24	<0.000***	2.0	0.157
- Oral care.	15	37.5	32	80.0	30	75.0	17.00	<0.000***	13.24	<0.000***	2.0	0.157
- ETT care.	13	32.5	32	80.0	30	75.0	19.00	<0.000***	17.00	<0.000***	3.0	< 0.05
- Care of Tracheostomy Tube.	13	32.5	32	80.0	31	77.5	19.00	<0.000***	17.00	<0.000***	3.0	< 0.05
- Obtaining an ABGs	13	32.5	32	80.0	30	75.0	19.00	<0.000***	17.00	<0.000***	3.0	< 0.05
-Weaning	13	32.5	32	80.0	30	75.0	19.00	<0.000***	17.00	<0.000***	3.0	< 0.05
- Assist with Extubation& Decannulation	14	35.0	33	82.5	32	80.0	19.00	<0.000***	18.00	<0.000***	3.45	< 0.05
-Deale with MV troubleshooting	13	32.5	32	80.0	29	72.5	19.00	<0.000***	17.00	<0.000***	3.0	< 0.05
Total score	13	32.5	32	80.0	30	75.0	24.34	<0.001**	20.26	<0.001**	3.65	<0.05*

- Not significant P> 0.05(NS) * Significant P < 0.05(S) ** Highly significant P < 0.001(HS) ***Very highly significant P < 0.001(VHS- T1=pre/ post T2= pre/ follow up T3= post/ follow up

Table (4): Correlation between total score of nurses' knowledge pre/post and follow up phase and total score of nurses' practice pre/post and follow up phase.

Total Score of Nurses' Knowledge	Total Score of Nurses' Practice					
	pre-phase		Post- phase		Follow up - phase	
	R	P-value	R	P-value	R	P-value
pre-phase	0.827	<0.000***	0.347	0.028*	0.316	0.047*
Post- phase	0.320	0.044*	0.458	<0.001**	0.893	<0.001**
Follow up - phase	2540.	0.114	0.135	0.048*	0.902	<0.001**

- Not significant P> 0.05 * Significant< 0.05 ** Highly significant P < 0.00

Table (5): Relation between total score of nurses' knowledge and their demographic characteristics

Items	Total Score of Nurses' Knowledge						Paired t-test						ANOVA	
	Pre		Post		Follow up		T ₁		T ₂		T ₃		f	P-value
	Mean	SD	Mean	SD	Mean	SD	t	P-value	t	P-value	t	P-value		
Age														
< 20 - < 30	49.381	9.785	68.142	8.805	65.142	8.962	-8.489	<0.001**	-7.760	<0.001**	2.415	<0.001**	1.000	0.423NS
30- < 40	44.000	17.362	65.375	11.277	63.500	11.401	-4.559	<0.001**	-4.017	<0.001**	2.374	<0.001**	4.310	0.023*
+ 40	56.333	2.517	69.000	7.549	66.590	11.997	-3.295	<0.001**	-1.473	<0.001**	1.571	0.026*	20.000	<0.001**
sex														
Male	47.545	10.699	69.454	7.594	67.272	8.626	-5.290	<0.001**	-4.652	<0.001**	1.628	<0.001**	17.472	<0.001**
Female	47.227	14.400	66.206	10.338	64.172	10.467	-6.976	<0.001**	-5.983	<0.001**	3.459	<0.001**	7.959	<0.05*
Qualifications														
Diploma	48.000	11.371	67.381	8.089	65.809	9.141	-8.183	<0.001**	-8.126	<0.001**	2.467	<0.001**	16.000	<0.05*
Diploma& specialty	51.125	11.344	66.400	14.604	61.600	13.334	-3.227	<0.001**	-2.262	<0.001**	2.418	<0.001**	7.748	0.013*
Technical Nursing institute	38.166	20.682	65.125	6.377	64.000	6.3116	-4.448	<0.001**	-2.624	<0.001**	2.374	<0.001**	7.759	0.009*
Bachelor	52.800	11.593	69.333	13.217	66.500	13.169	-3.447	<0.001**	-2.916	<0.001**	1.688	<0.001**	10.126	<0.001**
Years of experience														
<5	44.789	15.230	70.157	9.044	68.315	9.586	-6.641	<0.000**	-6.012	<0.000***	2.071	<0.000***	4.200	0.037*
5- <10	51.900	7.0150	65.000	8.755	63.100	9.146	-5.363	<0.000**	-4.626	<0.000***	1.760	<0.000***	6.157	0.007*
10 - 15	53.000	9.643	65.333	7.767	68.666	9.082	-3.049	<0.000***	-3.265	<0.000***	2.138	<0.000***	1.000	0.444NS
+ 15	47.625	15.702	63.500	12.083	60.500	11.513	-5.099	<0.000***	-3.396	<0.001**	2.421	<0.000***	14.832	<0.000**
Work area														
ICU	49.381	9.785	68.142	8.805	66.142	8.962	-8.489	<0.001**	-7.760	<0.001**	2.415	<0.001**	20.000	<0.001**
RICU	44.000	17.362	65.375	11.277	63.500	11.401	-4.559	<0.001**	-4.017	<0.001**	2.374	<0.001**	4.310	0.023*
CTICU	56.333	2.517	69.000	7.549	66.590	11.997	-3.295	<0.001**	-1.473	<0.001**	1.571	0.026*	1.000	0.423NS
Categories														
Supervisor	56.500	3.535	37.000	4.242	61.500	6.363	-33.00	<0.001**	-7.500	<0.001**	1.000	<0.001**	16.846	0.013*
Head nurse	56.625	7.986	68.250	10.152	66.500	11.563	-3.009	<0.001**	-2.276	<0.05*	1.618	<0.001**	6.746	0.009*
Staff nurs	45.100	13.973	66.400	9.859	64.200	9.809	-8.007	<0.001**	-7.035	<0.001**	3.217	<0.001**	20.881	<0.001**
Previous training courses about MV														
Yes	51.333	7.991	68.166	10.815	65.666	10.633	-3.846	0.012*	-3.919	0.011*	1.518	0.027*	22.085	<0.001**
No	47.117	14.079	66.911	9.630	65.088	10.034	-3.919	0.011*	-6.872	<0.001**	3.498	0.001*	3.182	0.085NS

- Not significant P> 0.05
- T1=pre/ post

* Significant P< 0.05
T2= pre/ follow up

** Highly significant P < 0.001
T3= post/ follow up

Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators

Table (6): Relation between the total satisfactory level of nurses' practices and their demographic characteristics.

items	Total Score of Nurses' practice						Paired t-test						ANOVA	
	Pre		Post		Follow up		T ₁		T ₂		T ₃		f	P-value
	Mean	SD	Mean	SD	Mean	SD	t	P-value	t	P-value	t	P-value		
Age														
< 20 - < 30	37.333	7.933	51.666	8.621	50.714	8.415	-6.720	<0.05*	-6.569	<0.001**	1.443	0.032*	3.185	0.149
30 - < 40	33.937	14.977	50.125	9.471	49.750	9.595	-4.336	<0.001**	-4.206	<0.001**	1.004	<0.001**	18.156	<0.001**
+ 40	45.333	2.081	53.333	5.033	51.666	7.767	-2.667	<0.001**	-1.357	<0.001**	1.001	<0.001**	19.000	<0.001**
sex														
Male	36.545	8.970	53.363	5.334	52.363	5.408	-5.575	<0.001**	-5.324	<0.001**	2.415	<0.001**	22.750	<0.001**
Female	35.965	12.196	50.344	9.566	49.655	9.600	-5.882	<0.001**	-5.324	<0.001**	1.736	<0.001**	7.368	<0.05*
Qualifications														
Diploma	36.523	10.279	51.285	6.167	51.000	6.899	-8.210	<0.05*	-7.960	<0.001**	1.621	<0.05*	27.069	0.010*
Diploma& specialty	41.200	10.616	49.400	14.310	46.600	13.649	-3.311	<0.05*	-2.964	<0.05*	1.000	0.023*	3.855	0.067NS
Technical Nursing institute	28.333	15.832	54.333	5.278	52.500	5.648	-2.556	<0.05*	-2.556	<0.05*	1.426	<0.05*	9.606	0.005*
Bachelor	41.300	8.945	59.625	11.734	58.622	11.632	-2.129	<0.001**	-1.814	<0.050*	1.532	<0.001**	6.536	<0.001**
Years of experience														
<5	34.368	11.823	53.842	8.301	52.789	8.350	-6.278	<0.001**	-5.906	<0.001**	1.447	<0.001**	2.333	0.133 ^{NS}
5- <10	40.100	6.279	49.400	6.449	48.800	6.663	-4.169	<0.05*	-4.096	<0.05*	1.000	<0.001**	1.000	0.444 ^{NS}
10 - 15	40.666	6.658	53.883	6.506	52.893	6.506	-2.115	<0.05*	-2.109	<0.05*	1.100	<0.05*	16.612	<0.001**
+ 15	35.875	15.833	47.000	11.426	46.375	11.500	-3.101	<0.05*	-2.721	<0.05*	1.000	<0.001**	14.832	<0.001**
Work area														
ICU	35.950	7.721	48.000	8.394	49.450	8.405	-5.794	<0.001**	-5.794	<0.001**	1.415	<0.001**	30.000	<0.001**
RICU	37.800	5.349	54.500	3.979	51.400	5.660	-6.894	<0.001**	-6.395	<0.001**	2.276	<0.05*	9.000	<0.05*
CTICU	36.600	19.923	51.300	11.870	50.300	11.397	-2.295	<0.001**	-2.625	<0.05*	1.071	<0.001**	6.891	<0.05*
Categories														
Supervisor	43.375	6.588	53.125	6.128	52.500	6.928	-2.000	<0.001**	-21.000	<0.001**	1.000	<0.001**	4.000	0.111
Head nurse	45.000	2.828	56.000	2.828	56.000	2.828	-2.651	<0.001**	-2.333	<0.05*	1.000	<0.001**	28.353	<0.001**
Staff nurs	34.166	11.691	50.333	9.378	49.466	9.216	-7.167	<0.001**	-6.820	<0.001**	1.741	<0.001**	2.333	<0.05*
Previous training courses about MV														
Yes	40.500	6.220	53.166	6.145	51.333	6.055	-3.907	<0.05*	-4.594	<0.05*	1.005	<0.05*	20.425	<0.001**
No	33.944	14.123	48.055	14.532	47.500	14.627	-6.717	<0.001**	-6.395	<0.001**	1.724	<0.05*	14.468	<0.001**

- Not significant P> 0.05

- T1=pre/ post

* Significant P < 0.05

T2= pre/ follow up

** Highly significant P < 0.001

T3= post/ follow up

Discussion

The current study, clarify that the mean age of the studied nurses' was 31.38 ± 6.88 , this finding was supported by *Ali, (2013)* in titled (Critical care nurses' knowledge and compliance with VAP bundle at Cairo University Hospitals critical care and emergency nursing)who reported that mean age of nurses was 27.26 ± 5.69 . In addition, *Majeed, (2017)* in titled (Assessment of knowledge and practices of ICU nurses about ETT suctioning for adult patients in Baghdad teaching hospitals)who reported that the mean age of nurses was (30.70 ± 5.99) .

Related to gender, the study showed that more than two-thirds of the studied nurses were females and less than one-third of them were male. This result comes in agreement with *Abd Elbaky; Youssef; EL-Soussi; & Abd EL-Aziz, (2014)* in their study titled (Improving internship knowledge and performance about oral hygiene bundle for

mechanically ventilated patients) who reported that more than two-thirds of nurses were female and less than one-third of them were male.

In relation to the work area, the present study showed that half of the studied nurses were working in ICU, one-quarter of them were working in RICU and the other quarter working in CTICU. This result comes in agreement with *Ali, (2013)* who reported that less than half of the nurses were working in ICU and more than half of them are working in CTICU.

According to years of experiences, the present study showed that less than half of the studied nurses had experience <5 years and one-quarter of them had experience 5- <10 years. While one-fifth of them had experienced more than 15 years. This result comes in agreement with *Abbas, & Mua'ala, (2013)* in their study titled (Impact of education program upon nurses' knowledge towards patients' under MV at Teaching Hospitals in Baghdad City) who

reported that less than half of nurses had experience <5 years.

As regard attending training courses about the care of patients on MV, the result of the present study showed that majority of the studied nurses didn't attend any training courses about the care of patients on MV. This result comes in agreement with *Zainib, et al., (2017)* who reported that about two third of nurses didn't attend any training courses. This might be due to the shortage of training courses and shortage in time.

These study finding showed also that, there were highly statistically significant differences between total score of nurses' level of knowledge regarding caring for patients on MV pre/post implementation of SLP, and post/follow up phase. Also, there was a statistically significant difference between the total score of nurses' level of knowledge pre/ follow up phase implementation of SLP. This could be explained by nurses' interest and their needs to acquire knowledge about this subject and the nurse's awareness of the importance of gaining knowledge in this field in order to accomplish their duties properly. This finding supported by *Abd EL-Aziz, (2014)* in titled (Effects of educational program on nurses' knowledge and skills about oral care for traumatized patients on MV) who reported that improvement in nurses knowledge after implementation of the educational program.

The finding of this study revealed that there were highly statistically significant differences post implementation of SLP, as well as follow up phase, competent nurses' level of practices regarding (Assist with intubation; connect ventilator & suctioning (oral & nasopharyngeal); oral & ETT care; weaning from MV and deal with MV troubleshooting compared to pre SLP implementation. This result reflected planned SLP was effective in the improvement of nurses' level of practices regarding MV procedures.

This result comes in agreement with *Indira, (2012)* and *Belal, (2011)* who reported that there was a statistically significant improvement in the nurses' level of practice about MV post implementation of the educational program compared to pre implementation program.

Regarding the relation between nurses' level of knowledge & practice and their age, the findings of this study showed that, there were statistically significant relation of total score of nurses' level of knowledge & practice and their age. As there were higher mean scores for nurses' level of knowledge & practice in three phases of SLP, implementation for nurses' age + 40 years. This finding was contrary with *Mahmoud, (2015)* in titled (Assessment of Nurses' Performance Regarding Management of Patients on MV) who reported that there was no statistically significant relation of knowledge & practices were found between ICU nurses and their age.

In relation to nurses' knowledge & practice and their qualifications, the findings of this study showed that there were highly statistically significant relation between total score of nurses' knowledge and their qualifications. As, there were higher mean scores for nurses' level of knowledge & practice in three phases of SLP, implementation for nurses have bachelor than nurses have the diploma or technical nursing institute. In similar studies, this finding was supported by *Belal, (2011)* and *Alomari, (2012)* who reported that there was highly statistically significant relation of knowledge and practice was found between ICU nurses and their educational level.

In relation to nurses' knowledge & practice and their years of experience, the findings of this study showed that there were highly statistically significant relation between total score of nurses' knowledge & practice and their years of experience pre/post implementation of SLP, pre/follow up phase and post/follow up phases. As there

Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators

were higher mean scores for nurses' level of knowledge & practice in three phases of SLP, implementation had experience 10 – 15 years than 5- <10 and <5 years. These findings are in contrast with *Ally, (2012)* and *Mahmoud, (2015)* who reported that there was no a statistically significant difference in knowledge and practice was found between ICU nurses and experience years.

In relation to nurses' knowledge & practice and their previous training courses about MV, the findings of this study *showed that*, there were statistically significant differences between the total score of nurses' knowledge & practice and their previous training courses about MV. *The study finding was contradicted with Mahmoud, (2015)* who reported that there was no statistically significant difference in knowledge & practice was found between ICU nurses and their previous training courses.

In relation to nurses' knowledge & practice and their categories, the findings of this study showed that there were highly statistically significant differences between total score of nurses' knowledge & practice and their categories at pre/post implementation of SLP and pre/follow up phase and post/follow up phase of implementation. As well, there were higher mean scores for nurses' knowledge & practice in three phases of SLP, implementation for a head nurse than a staff nurse. This might be due to head nurses had highly qualified and professional.

In relation to nurses' knowledge & practice and their gender, the findings of this study showed that there were highly statistically significant differences between total score of nurses' knowledge & practice and their gender pre/post implementation of SLP and pre/follow up phase and post/follow up phase of implementation. As there were higher mean scores for nurses' knowledge in three phases of SLP, implementation for male than female. These findings disagree with *Abbas, & Mua'ala, (2013)* and

Mahmoud, (2015) who reported that there was no statistically significant difference in knowledge & practice was found between ICU nurses and their gender.

Conclusion

Based on the findings of the present study, it can be concluded that:

There was the statistically significant positive effect of SLP implementation on nurses' level of knowledge and practice as regards caring for patients on MV at post implementation and follow up phases .

Also, all of the studied nurses' opinions regarding the content of SLP for nurses' caring for patients on ventilators were satisfactory.

Recommendation

On the light of the current study findings the following recommendations are suggested.

- The importance of conducting the SLP in a wider field including all hospitals to raise the efficiency of nursing care provided.
- Critical care units in hospitals should be supplied by Arabic SLP for nurses' performance caring for patients on ventilators to improve the quality of patient's care and consequently decrease the complications for these patients.
- Multiple SLP should be designed and performed to facilitate the learning process on other subjects such as preventing complications of MV and nurses' performance caring for patients on ventilators.
- A further study to be carried out in different settings on a larger sample for a wider utilization of the SLP, in order to achieve generalization of the results.

- Solve conflict between different nurse's categories by dissemination and availability of job description.
- Availability of supplies and equipment needed for MV care in critical care units.

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Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators

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