Effect of self -learning module on nurses' performance regarding care of patients with chest tube

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Abstract

Background; Self- learning module (SLM) is essential in assisting nurses to meet the challenges presented in today's health care environment. **Aim;** the study aimed to evaluate the effect of self -learning module on nurses' performance regarding care of patients with chest tube**. Design;** Quasi experimental design was used. **Setting**; the study was conducted at general chest department and chest intensive care unit at Benha University Hospital. **Subjects;** All available nurses **(50)** who were working in previous settings and agreed to participate in the study **.Tools**: two tools were used; **(Tool I)**: nurses self-administered questionnaire for assessing nurses' knowledge regarding care of patient with chest tube and underwater seal drainage system **(Tool II):** nurses' practice observational checklist for assess level of nurse's practice regarding caring of patient with chest tube and underwater seal drainage system. **Results;** revealed that 46% were in the age category of 25≥ 30, 48% of nurses had diploma education level and 36% had experience of 5≥10year. Regarding total nurses' knowledge level 4% of them have satisfactory pre SLM intervention, however after one month post intervention 96% were having satisfactory but after 3months slight decline to 92% in level of knowledge. Regarding their total practices score only 6% of them have adequate level pre SLM intervention, while one month post intervention, 46% of them have adequate level but after 3 months slight decline to 34% adequate level. **Conclusion**: The majority of studied nurses had unsatisfactory knowledge and inadequate practices before SLM intervention, while they had satisfactory knowledge and adequate practices post SLM intervention. Also there will be a significant positive correlation between nurses' knowledge and practice post implementing SLM. **Recommendations;** Self -learning modules should be developed by nurse educators as a learning source material available to staff nurses in clinical settings for learning at their own time and pace, also building the flexibility and create awareness among staff nurses about significance of self-directed learning.

Keywords: Chest tube, Nurses' performance, Self –learning module.

Introduction:

Whenever fluid or air accumulates in the pleural space, the pressure becomes positive instead of negative and the lung collapse. Chest tubes are inserted to drain the pleural space and re-establish negative pressure, allowing for proper lung expansion. Tubes may be inserted in the mediastinal space to drain air and fluid post -operatively [1].Chest tubes come in a variety of shapes and sizes. Depending on what they are needed for, they can range in diameter from as small as a shoelace to as large as a highlighter .Chest tubes are usually connected to drainage systems that collect fluid and allow air to escape from the chest. These systems can be allowed to drain passively or can have suction applied to them [2].

Chest tube used to create negative pressure in the chest cavity and allow re-expansion of the lung. It helps remove air (pneumothorax), blood (hemothorax), fluid (pleural effusion or hydrothorax), chyle (chylothorax), or purulence (empyema) from the intra-thoracic space. There are other uses for chest tube that are not as common and rarely indicated. Typically for a tension pneumothorax needle decompression occurs first and chest tube placement quickly follows after the patient stabilizes from decompression [3].

A chest tube may be inserted for several reasons to re-expand the lungs when a lung collapses (pneumothorax). [4] After surgery for lung cancer to drain fluids that remain in the space created after a portion of a lung is removed [5]. For pleural effusions, both benign and malignant pleural effusions caused by heart failure, pulmonary embolism ,lung cancer and cirrhosis[6]After heart surgery to remove fluids that accumulate in the chest. If there is bleeding into the chest (hemothorax), for example, from a trauma and to drain pus from an infection or abscess [7]. Chest tube is used as a delivery conduit to introduce medication or fluid into the pleural space; internal warming allows warm fluid to circulate through the thoracic space to provide an external heat source for the core and circulating blood volume. [8] Hyperthermic intrathoracic chemotherapy (HITHOC) allows for the delivery of chemotherapeutic agents directly into the thoracic space for malignant pleural mesothelioma and metastatic disease [9].

Other indication of chest tube includes need for pleurodesis; pleurodesis is a procedure used to treat patients with recurrent pleural effusions or recurrent pneumothorax. This procedure involves administering a sclerosing agent into the pleural space which causes the

visceral and parietal pleura to adhere to each other without the thin coating of fluid between them. Chemical pleurodesis is a painful procedure, and patients are often pre-medicated with a sedative and analgesics. A local anesthetic may be instilled into the pleural space, or an epidural catheter may be placed for anesthesia [10].

There are many complications for chest tube placement and removal. The rate of complications related to chest drain placement and management range from 5-35%.The most serious one is tension pneumothorax, which may occur due to the obstruction of the drainage system or during a removal. Other complications include accidental removal or dislodgement of the tube and bleeding, all of which could pose a threat to patient's life, increase morbidity, and prolong treatment [11]. Tube malposition represents a form of penetrating trauma and should be managed accordingly. Organ injury; the most common organ injury during tube thoracotomy is the lung, perforation of the heart, liver spleen, and diaphragm are also potential injuries. Increased duration of indwelling chest tubes can lead to potential for infection, empyema, and problems after removal such as recurrent pneumothorax and tension pneumothorax [12].

Insertion-related complications include esophageal perforation, aortic impingement, laceration of vasculature, injury of organs above/below the diaphragm, diaphragmatic perforation or paralysis, and subcutaneous placement. Malposition of the tube may cause Horner's syndrome, arteriovenous fistula formation, re-expansion pulmonary edema, contralateral pneumothorax or cardiogenic shock from compression of the right ventricle. Also, pulmonary lacerations are more common in patients with parenchymal consolidations, pleural adhesions, and/or poor lung compliance. Heart laceration or compression is very rare, it results from tube compression or penetration of the structure during insertion such fatal right atrial laceration during placement has been reported in a patient with severe kyphoscoliosis and chest wall deformity [13]. Esophageal injury following tube chest tube placement is rare. Presence of enteric, salivary content, or yeast in the tube thoracostomy container should raise suspicion for this complication [14]. Gastric injury from chest tube placement is associated with subdiaphgragmatic insertion. This complication can also occur as a result of anatomically 'proper' tube thoracostomy placement in the presence of an

unrecognized intrathoracic gastric herniation, typically with a concurrent diaphragmatic injury [15].

Complications during chest tube maintenance include posttraumatic empyema; it has an incidence of 2% to 25% and carries a mortality rate of 4% .The rate of posttraumatic empyema is generally elevated in patients with retained hemothorax, risk factors include prolonged tube thoracostomy duration, length of ICU stay, concomitant lung contusion, and need for laparotomy [16]. Subcutaneous emphysema can occur with tube thoracostomies, it usually involves the chest wall, neck, and face, but may spread further with large air leaks. Risk factors include poor tube placement, tube blockage, or migration of the 'sentinel hole' out of the pleural space [17].

Most often the nursing management of patient, who has a chest drain in situ, has received little attention. After a chest tube is inserted, nurses are responsible for managing the chest tube and drainage system. They should have adequate knowledge regarding the chest-tube position, controlling fluid evacuation, identifying when to change or empty the containers, and caring for the tube and drainage system during patient transport. The water-seal container should not be changed and clamped unnecessarily [18]. Nursing care of chest tube aims to maintaining an intact sterile system to prevent contamination and introduction of infection through the drainage system into the pleural space, ensure the whole system remains straight, secure all connections tube to prevent tension pneumothorax and water aspiration and monitoring the patient to prevent risk of complications [19].

Self- learning module is essential in assisting nurses to meet the challenges presented in today's health care environment. Nurse educators have an important role to play in assisting nurses to acquire the skills for self- learning module, and to do this they need to understand the concept of self- learning module [20] The self-learning module (SLM) refers to self-instructional, self-explanatory, self-contained, self-directed, self-motivating and self-evaluating material to assess the achievement of the learner [21].

Self-learning module is an orderly set of instructions designed to facilitate the learner's mastery of a body of knowledge or a procedure. When combined with other modules, learners can master a comprehensive body of knowledge or a complex process. Self- learning

modules are useful for more than one purpose. For example, they can facilitate learning for individualized or self-paced instruction. They can also supplement traditional instruction in order to provide more thorough and/or additional training. Learners will realize the benefits of competency-based education, whether they use digital or print self-paced learning modules [22].

Significance of the study:

Care of chest tube is one of the most important nursing procedures because patients who need chest tubes are usually seriously ill and require advanced nursing care. Accordingly, specialized and expert nursing care can prevent serious complications. So, the nursing care for the patient with chest tube drainage systems need to efficient knowledge and skills, nurses are responsible for the safety care giving, so they must be knowledgeable and skillful practices of chest tube drainage system [23].

Nurses play a role in improving the patients' health, and they recognize the importance of lifelong learning to keep their knowledge and skills current. [24].So, self-learning is that instead of instructor-centered learning. It takes the learner at the center. Also, control and learning responsibility is at the learner, he determines what, how, where and when to learn so, this study was conducted to provide nurses with self- learning module to improve nurses' performance regarding care of patient with chest tube.

Aim of the Study:

This study aimed to evaluate the effect of self -learning module on nurses' performance regarding care of patients with chest tube**.**

Research hypotheses

The following research hypotheses were formulated to achieve the aim of this study:

Hypothesis (1): Nurses' knowledge regarding care of patient with chest tube will be improved after implementing the self-learning module than before.

Hypothesis (2): Nurses' practices regarding care of patient with chest tube will be improved after implementing the self –learning module than before.

Hypothesis (3): There will be a significant positive correlation between nurses' knowledge and practice post implementing self-learning module.

Subjects and methods:

Research Design: A quasi-experimental research design was utilized to conduct the aim of this study.

Settings:

   This study was conducted at general chest department and chest intensive care unit at Benha University Hospital, which located on the third floor, the general chest department consists of three big rooms; each room contains six beds, and chest intensive care unit contains eight beds.

Subjects:

Sample Type: Convenience

Sample size:

All available nurses who were working in previous settings and agreed to participate in the study **(No=50)**

Tools of data collection
   Data collected through the utilization of the following tools:

Tool .I: Nurses self-administered questionnaire:

This questionnaire was developed by researcher after reviewing the related and recent literatures *(Mohammed, 2015[19]; Hinkle and Cheever, 2017[25]& Randelle,2019[26])*.It was written in simple Arabic language for assessing nurses' knowledge regarding care of patient with chest tube and underwater seal drainage system.

It consisted of two parts as follow:

Part A): concerned with demographic characteristics data of nurses including: age, gender, marital status, qualification, years of experience, and attendance of previous training courses about care of patient with chest tube.

Part B): Nurses' knowledge which included 37 items about anatomy of respiratory system, definition of chest tube, indication, contraindication, complication, nursing role during chest tube insertion ,care of patient with underwater seal drainage system ,nursing role during accidental problems of chest tube and under water seal drainage system, role of nurse during and after chest tube removal**.**

Scoring system:

Knowledge obtained from nurses was scored and calculated. Each question was ranged from 0 −1 grade. Whereas, correct answer scored 1 grade and score zero for incorrect answer. The total score level for the questionnaire sheet was 37 grades (equal 100%).

- $\geq$ 80% (29 grads) considered satisfactory knowledge.

- $\leq$ 80% (28 grads) considered unsatisfactory knowledge.

Tool II: Nurses' practice observational checklist:

This tool was developed by the researcher after reviewing the related and recent literatures *(Mohammed, 2015[19]); Tarhan, etal., 2016[27]& Randelle, 2019[26])*.It was used to assess level of nurse's practice regarding caring of patients with chest tube and underwater seal drainage system.

It included 7 main items of practices containing 55 steps such as; preparation before chest tube insertion (7 steps), care after chest tube insertion (5 steps), patient's assessment (6 steps), chest drainage system assessment and management (10 steps), changing a chest-tube insertion-site dressing (13 steps), documentation (8 steps) and removal of chest tube (6 steps).

Scoring system:

Each step in the observational checklist was checked as done and not done.

One mark was given for done correct step and zero for done incorrect or not done step, total nurses' practice score will be categorized into two levels: adequate $\geq$ 80% of total score, inadequate < 80% of the total score.

Procedures

An official permission to carry out the study was granted from the Dean of Faculty of Nursing, Benha University, hospital directors, and head of the chest department at Benha University Hospital. The study's objective and nature explained, so it became possible to carry out the study with minimum resistance.

Ethical Considerations

All ethical issues were taken into consideration during all phases of the study and included the following: the research approval was obtained before self -learning module implementation, also the approval taken from the Ethics' Committee in the Faculty of Nursing to conduct this study. The objectives and aim of the study were explained to all nurses and the researcher maintained anonymity and confidentiality of the subjects. Nurses were reassured that the obtained information was used only for the purpose of the study. They have the right at any time to withdraw from the research without giving any reason.

Preparatory phase:

This phase included the following; reviewing the available literature and different studies related to research problem, and theoretical knowledge of its various aspects of the study, using textbooks, evidence-based articles, internet periodicals and magazines in order to collect tools of this study.

Tools' validity; tested through a jury of five experts from the medical-surgical nursing department, faculty of nursing, Benha University. The consensus among experts regarding nurses' self-administered questionnaire was 97% and the observational checklist was 98% for most items. The same experts revised the self -learning module based on the current literature and the consensus was 97%.The modification was carried out according to the panel's judgment on the clarity of sentences, appropriateness, and completeness of the content.

The reliability of the proposed tools was tested by Cronbach's alpha test (0.943) for nurses' self-administered questionnaire and (0.796) for observational checklist.

Pilot study

A pilot study was carried out on 10% of the studied subjects (5 nurses) who were excluded from the main study. The pilot study was done to ensure clarity, applicability, feasibility of conduction of the study tools, and time needed for each tool to be filled in. Some modifications were done according to the pilot study findings.

Field of work: The process of data collection extended over 7 months from the beginning of August 2020 to the end of February 2021.

The study was carried out through four phases: assessment, planning, implementation, and evaluation.

Assessment Phase:

The researchers visited the general chest department and chest intensive care unit two days weekly at (morning & afternoon) shifts to collect the data by using previous tools. The researchers interviewed with the available nurses in previous settings, introduced themselves to initiate communication, explained the aim of the study and took their verbal approval to participate in the study prior to data collection,. The researchers assessed the nurses' knowledge and practices regarding care of patient with chest tube using questionnaire sheet and observational checklist as following:

Firstly: The researchers observed nurses' practice during care of patients in the field work using observational checklist (tool II). It was filled in by the researchers by direct observation carried out before implementing SLM (pre -test). The average time needed for the completion of each observational checklist took about 40 − 45 minutes. The assessment of nurse's practice was done through three times of observation. The researcher spent six hours per day in observing nurses during morning & afternoon shifts. The researcher observed each nurse three times for each skill and the mean was calculated.

Secondly: The researchers explained the questionnaire sheets (tool I). Then distribute it to all nurses individually to assess their knowledge regarding care of patients with chest tube. The

average time needed for the completion of a questionnaire by the nurse was between 25–30 minutes. This period of pretests (knowledge and practice) took three months.

Planning Phase (Self-learning module development)

A designed self –learning module was developed by researchers based on nurses' needs assessment, literature review, researchers' experience, and opinions of experts. The researchers designed a booklet and videos on mobile about care of patient with chest tube, the booklet was written in the Arabic language with illustrations, involving theoretical and practical parts.

The theoretical part included information about anatomy of respiratory system, definition of chest tube, indication, contraindication, complication, and knowledge about nursing care during chest tube insertion, continuous care of patients with underwater seal drainage system, role of nurse during accidental problems of chest tube and under water seal drainage system, role of nurse during and after chest tube removal**.**

The practical part included the procedures regarding nursing role before chest tube insertion, nursing care after chest tube insertion, care of patient with chest drainage system, patient assessment and drainage assessment, role of nurse when accidental problem occurs in chest tube or under water seal drainage system, role of nurse during and after chest tube removal.

Implementation Phase:

The self-learning module (booklet and Videos on mobile) was given for nurses with clarification related to how the module is to be used. Contacts with the nurses were done through the interviewing in the chest department and chest ICU and through telephone to explain some difficult points of the SLM which encountered the nurses during the time of the study.

Evaluation phase:

The effect of SLM on nurses' knowledge and practice were done post one month of implementing the module and post third month as follow up using the same tools.

Statistical analysis

The collected data were organized, coded, computerized, tabulated, and analyzed by using the Statistical Package for Social Science (SPSS) version (20). Data were presented using

descriptive statistics in the form of frequencies, percentages. Chi-square test(X2) was used for comparisons between qualitative variables to find out relations. Correlation coefficient (r) was used to test the relation between quantitative data. Statistical significance was considered to be:

- P value > 0.05 non-significant.
- P value ≤ 0.05 significant.
- P value < 0.01 highly significant.

Results:

Table (1): Demonstrates distribution of the studied nurses according to their socio demographic characteristics. It shows that, 46% were in the age category of 25≥ 30 with mean age 31.22 ± 9.28. Also, 80% were females and 76% of them were married, 48% of nurses had diploma education level and 36% had experience of 5≥10year in nursing and 64% of them did not attend training courses about chest tube.

Table (2): Illustrates comparison of the studied nurses' knowledge regarding care of patients with chest tube pre/post and follow up of self- learning module intervention. It shows that 86%,94%.88% respectively of the studied nurses had incorrect answers pre self -learning module intervention related to role of nurse during chest tube insertion, care of patient with under water seal system and role of nurse during accidental problems ,while first month post intervention (2%, 2% and 0% respectively) had incorrect answers related to those items, but after three months there was slight increase in these results.(9%,12% and 13%) respectively. Also, there were a highly statistical signification different between all items of knowledge pre, post and follow up (P<0.001).

Figure (1): Frequency distribution of studied nurses regarding their total knowledge through all phases of intervention (n=50). This figure documents that 4% of studied nurses have satisfactory total knowledge pre self -learning module intervention, however after one month post intervention 96% were having satisfactory level of knowledge but after 3 months follow up slight decline to 92% in level of knowledge was observed.

Table (3): Demonstrates comparison of the studied nurses' practice related to care of patients with chest tube pre/post and follow up self- learning module intervention. It shows that 56%, 32% and 64% respectively of the studied nurses had adequate practice pre self –

learning module intervention related to preparing patients before chest tube insertion, care after insertion and removal of chest tube ,while one month post intervention 90%,78% and 92% respectively of them had adequate level of practice related to those items, but after three months there was slight decline in these results. Also, there were a highly statistical signification different between most items of practices pre, post and follow up (P<0.001).

   Figure (2): Frequency distribution of studied nurses regarding their total practices score through all phases of intervention (n=50).This figure shows that only 6% of the studied nurses have adequate level of practices pre self- learning module intervention, while one month post intervention, 46% of them have adequate level of practices, but after 3 months follow up slight decline observed as 34% have adequate level of practice.

   Table4: Shows correlation coefficient between total knowledge and total practice during post and follow up self- learning module intervention. It demonstrates that there was appositive statistically significant correlation between total knowledge and total practices post and follow up SLM intervention.

   Table (5) Displays relation between socio-demographic characteristics and nurses' knowledge pre/post and follow up self- learning module intervention. It illustrates that there was no statistically relation between nurses' knowledge and socio-demographic characteristic in all items except in qualification, there was statistically significant relation at pre self - learning module intervention (P< 0.05).

   Table (6) Shows relation between socio-demographic characteristics and nurses' practice pre/post and follow up self- learning module intervention. It is noted that there was no statistically relation between practice and socio-demographic characteristic in all items except in qualification. There was statistically significant 1st months post intervention (P< 0.05).

Table (1): **Distribution of the studied nurses according to demographic characteristics (N=50)**

Demographic characteristics	N = 30	
Nurses age	**No.**	**%**
- 18≥25	10	20.0
- 25≥ 30	23	46.0
- >30	17	34.0
Mean ± SD 31.22 ± 9.28		
Gender		
Male	10	20.0
Female	40	80.0
Marital status		
Single	11	22.0
Married	38	76.0
Divorced	1	2.0
Widow	0	0.0
Level of education		
Diploma (secondary school)	24	48.0
Diploma + specialty	4	8.0
Technical nursing institute	15	30.0
Bachelor degree	7	14.0
Years of experience		
<1year	2	4.0
1<5year	15	3.00
5<10year	18	36.0
>10 year	15	30.0
Attendance of training courses		
Yes	18	36.0
No	32	64.0
if yes(n= 18) place		
Department	4	22.0
in hospital	14	77.0

Table (2): Comparison of the studied nurses' knowledge regarding care of patient with chest tube pre/post and follow up self- learning module intervention (n=50)

Items	pre intervention				post intervention (SLM)								$\chi^2 1$	$\chi^2 2$
	Correct		Incorrect		post 1 month				follow up (post 3 months)				(P 1)	(P 2)
					correct		incorrect		Correct		Incorrect			
	No	%	No	%	No	%	No	%	No	%	No	%		
Anatomy of respiratory system	43	86	7	14	50	100	0	0	47	94	3	6	7.52 **0.012***	1.778 **0.318**
Definition of chest tube	45	90	5	10	50	100	0	0	49	98	1	2	5.263 **0.056***	2.237 **0.204**
Purpose of chest tube	12	24	38	76	49	98	1	2	49	98	1	2	57.545 **0.000****	57.545 **0.000****
Indication of chest tube	23	46	27	54	50	100	0	0	48	96	2	4	36.986 **0.000****	30.355 **0.000****
Contraindication of chest tube	34	68	16	32	49	98	1	2	41	82	9	8	15.946 **0.000****	2.613 **0.165**
Complication of chest tube	22	44	28	56	47	94	3	6	41	82	9	8	29.291 **0.000****	15.487 **0.000****
Role of nurse during chest tube insertion	7	14	43	86	49	98	1	2	41	82	9	8	71.591 **0.000****	58.604 **0.000****
Care of patient with under water seal system	3	6	47	94	49	98	1	2	38	76	12	24	48.776 **0.000****	50.041 **0.000****
Role of nurse during accidental problem	6	12	44	88	50	100	0	0	37	74	13	26	78.57 **0.000****	39.208 **0.000****
Role of nurse during and after removal chest tube	30	60	20	40	50	100	0	0	44	88	6	12	25.00 **0.000****	10.187 **.001***

$\chi^2 1$(P 1) between pre and post implementation (one month)
$\chi^2 2$(P 2) between pre and follow up (3 months)

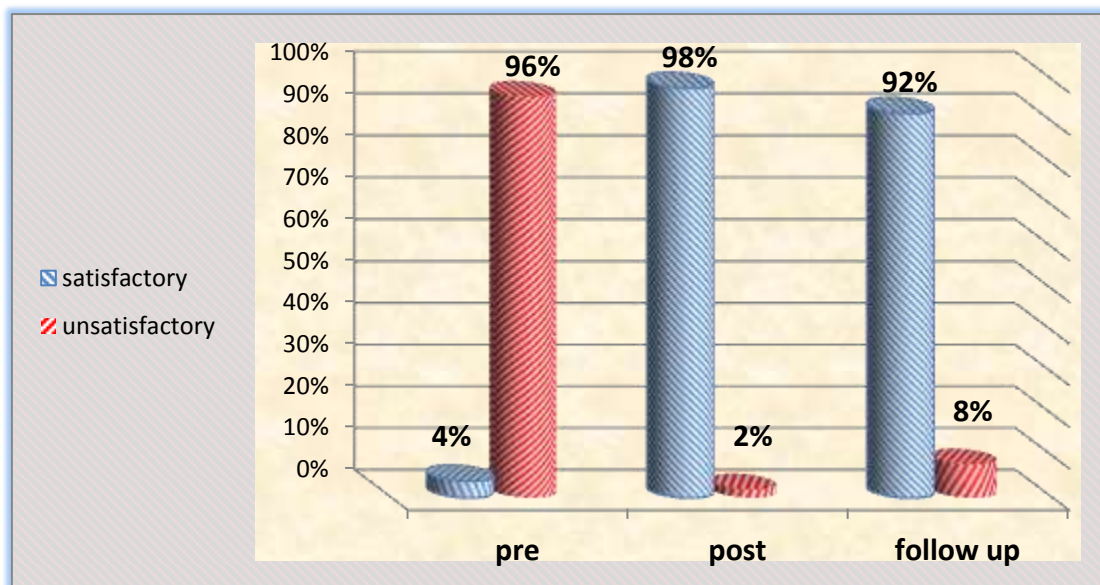p > 0.05 un-significance, P≤0.05* significance, P<0.001** highly significance

Figure (1): frequency distribution of studied nurses regarding their total knowledge through all phases of intervention (n=50).

Table (3): Comparison of the studied nurses' practice related to care of patients with chest tube pre/post and follow up self- learning module intervention (n=50)

nurses practice	pre intervention				post intervention (post 1 month)				follow up (post 3 months)				$\chi^2 1$ (P 1)	$\chi^2 2$ (P 2)
	satisfactory		unsatisfactory		satisfactory		unsatisfactory		satisfactory		unsatisfactory			
	N	%	N	%	N	%	N	%	N	%	N	%		
Preparation before chest tube insertion :	28	56	22	44	45	90	5	10	40	80	10	20	14.663 0.000**	6.618 0.009**
care after chest tube insertion:	16	32	34	68	39	78	11	22	35	70	15	30	21.374 0.000**	14.446 0.000
patient assessment	8	16	42	84	24	48	26	52	22	44	28	56	11.765 0.001*	9.333 0.004**
chest drainage system assessment and management	0	0	50	100	18	36	31	62	16	32	34	68	23.457 0.000**	19.048 0.000**
Changing a chest-tube insertion-site dressing	3	6	47	94	11	22	39	78	9	18	41	82	5.316 0.04*	3.409 0.06
- Documentation	3	6	47	94	17	34	33	66	14	28	36	72	12.250 0.001*	18.575 0.003*
Removal of chest tube	32	64	18	36	46	92	4	8	38	76	12	24	11.722 0.001*	1.741 0.138

$\chi^2 1$(P 1) between pre and post implementation (one month)

$\chi^2 2$(P 2) between pre and post and follow up (3 months)

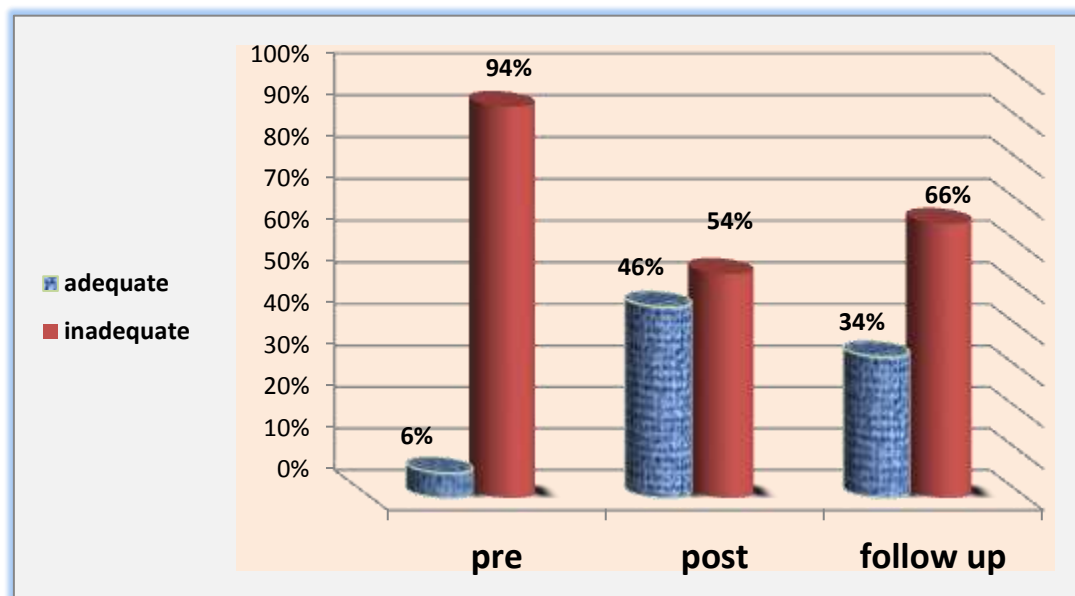p > 0.05 un-significance, P≤0.05* significance, P<0.001** highly significance

Figure (2): frequency distribution of studied nurses regarding their total practices score through all phases of intervention (n=50).

Table (4): Correlation coefficient between total knowledge and total practice during post and follow up self- learning module intervention.

Items	Total practice			
	post (1 month)		follow up (post 3months)	
	R	**p**	**R**	**P**
Total knowledge	.434	. 002*	.360	.01*

P > 0.05 un-significance, P≤0.05* significance, P<0.001 highly significance**

Table (5): Relation between socio-demographic characteristics and nurses' knowledge pre/post and follow up self- learning module intervention (n=50)

knowledge	Pre				X^2_1 p-value	after 1 month)				X^2_2 p-value	After 3 months				X^2_3 p-value
	unsatisfactory		satisfactory			unsatisfactory		satisfactory			unsatisfactory		Satisfactory		
	No	%	No	%		No	%	No	%		No	%	No	%	
Age in years:															
18<25	10	20	0	0	0.581 0.784	0	0	10	20	1.198 0.549	1	2	9	18	0.173 0.917
25<30	22	44	1	2		1	2	22	44		2	4	21	42	
<30	16	32	1	2		0	0	17	34		1	2	16	32	
Sex															
Male	10	20	0	0	0.521 0.637	0	0	10	20	0.255 0.800	2	4	8	16	0.322 0.851
female	38	76	2	4		1	2	39	78		2	4	38	76	
Marital status															
Single	11	22	0	0	0.658 0.720	0	0	11	22	0.322 0.851	2	4	9	18	2.023 0.364
Married	36	72	2	4		1	2	17	34		2	4	36	72	
Divorced	1	2	0	0		0	0	1	2		0	0	1	2	
Qualification															
Diploma	24	48	0	0	12.798 0.005*	1	2	23	46	1.105 0.776	4	8	20	40	4.710 0.194
Diploma + specialty	4	8	0	0		0	0	4	8		0	0	4	8	
Technical nursing institute	15	30	0	0		0	0	15	30		0	0	15	30	
Bachelor	5	10	2	4		0	0	7	14		0	0	7	14	
Years of experience															
< 1 years	2	4	0	0	1.100 0.777	0	0	2	4	1.814 0.612	0		2		0.483 0.923
1-<5years	14	28	1	2		0	0	15	30		1		14		
5-<10years	17	34	1	2		1	2	17	34		2		16		
≥10 years	15	30	0	0		0	0	15	30		1		14		
Training courses															
Yes	18	36	0	0	1.172 0.530	0	0	18	36	0.574 0.640	2	4	16	32	0.370 0.456
No	30	60	2	4		1	2	31	62		2	4	30	60	

X^2_1& p_1 value relation between pre and post

X^2_2& p_2 value between post and after 1 month

X^2_3& p_3 value between pre and months follow up In-significance (P > 0.05) significance* (P≤0.05) highly significance** (P<0.001)

Table (6): Relation between socio-demographic characteristics and nurses' practice pre/post and follow up self- learning module intervention (n=50).

Practice	Pre inadequate No	Pre inadequate %	Pre adequate No	Pre adequate %	X^2 1 p-value	After 1 month Inadequate No	After 1 month Inadequate %	After 1 month adequate No	After 1 month adequate %	X^2 2 p-value	After 3 months inadequate No	After 3 months inadequate %	After 3 months adequate No	After 3 months adequate %	X^2 3 p-value
Age in years:															
18<25	9	18	1	2	0.395	8	16	2	4	0.878	8	16	2	4	3.66
25<30	22	44	1	2	0.821	12	24	11	22	0.144	12	24	11	22	0.190
<30	16	32	1	2		7	14	10	20		13	26	4	8	
Sex															
Male	10	20	0	0	0.798	5	10	5	10	0.081	7	14	3	6	0.089
Female	37	74	3	6	1.00	22	44	18	36	0.526	26	52	14	28	0.539
Marital status															
Single	10	20	1	2	0.287	5	10	6	12	1.200	7	14	4	8	0.543
Married	36	72	2	4	0.899	21	42	17	34	0.549	25	50	13	26	
Divorced	1	2	0	0		1	2	10	20		1	2	0	0	0.762
Qualification															
diploma	23	46	1	2		12	24	12	24		17	34	7	14	
Diploma+speciality	4	8	0	0		0	0	4	8		3	6	1	2	0.880
Technical nursing institute	13	26	2	4	2.275 0.517	11	22	4	8	7.135 0.03*	9	18	6	12	0.830
Bachelor	7	14	0	0		4	8	3	6		4	8	3	6	
Years of experience															
< 1 years	2	4	0	0		1	2	1	2		2	4	0	0	
1-<5years	14	28	1	2	0.158	9	18	6	12	0.513	11	22	4	8	2.268
5-<10years	17	34	1	2	0.984	10	20	8	16	0.903	10	20	8	16	0.519
≥10 years	14	28	1	2		7	14	8	16		10	20	5	10	
Training courses															
Yes	16	32	2	4	0.254	9	18	9	18	0.181	14	28	4	8	1.739
No	31	62	1	2	0.291	18	36	14	28	0.46	19	38	13	26	0.157

X^2_1& p_1 value relation between pre and post
X^2_2& p_2 value between post and after 1 month
X^2_3& p_3 value between pre and months follow up
In-significance (P > 0.05)　significance* (P≤0.05)　highly significance** (P<0.001)

Discussion:

Chest tube is a safe and efficient procedure that is used to drain pleural collections including blood, air, pus and lymphatic fluid both in trauma and non -traumatic origins .Patient safety is promoted when the nurses are competent and their knowledge, skills, attitude and performance are related to evidence based practice protocols and standards of care [28] *(Chege, etal.,2018)*.

The present study aimed to evaluate the effect of self -learning module on nurses' performance regarding care of patient with chest tube. The discussion of current study cover four main parts; the first part Socio-demographic characteristics of studied nurses, second part was nurses' knowledge related to care of patient with chest tube pre /post and follow up self -learning module, the third part was nurses' practices regarding care of patient with chest tube pre/post and follow up of self- learning module and finally the fourth part discuss the correlation between total knowledge and total practice during post and follow up self-learning module intervention.

Regarding nurses' characteristics, the findings of the current study revealed that nearly half of the studied nurses were in the age category 25< 30 years with mean age 31.22 ± 9.28.This results might be due to most of the studied nurses graduated from diploma and technical nursing institute.

This result in accordance with *Ramya and Jose, (2013)*[24] whose study was" Effectiveness of self- instructional module on nursing management of patients with chest tube drainage for staff nurses working in a selected hospital of Odisha" and reported that more than half of the studied nurses were in the age category 20-30 years old. But this result disagreed with *Kesieme etal.,(2016*[29] in his study about" Nurses' knowledge of care of chest drain: A survey in a Nigerian semi-urban university hospital" and found that more than two-thirds of the studied nurses their age ranged between 31-40 years old.

As regard to nurses' gender, the current study showed that that the majority of nurses were females. This might be due to elevated number of females working in the nursing field more than males and a reflection of preponderance of women in nursing. This result agreed with *Kesieme etal.,(2016*[29]who found that most of the studied nurses were females and in the same line with *Kaur etal.,(2019*)[18] in his study entitled" A Study to assess the efficacy of self -instructional module (SIM) on the knowledge regarding nursing management of patients with chest drainage among staff nurses of selected hospitals of Malwa region of Punjab" and stated that most of the studied nurses were females.

But this results disagreed with *Jassim,etal.,(2015)*[30] in his study about" Evaluation of the nursing management for patients undergoing to water seal chest tube drainage system" who reported that more than half of the studied nurses were males.

Concerning to marital status, the present study finding result revealed that three quarters of the studied nurses were married, this result supported by *Bedier,etal.,(2016)* [31] in his study about "Impact of an educational program on nurses' knowledge related to care of patients with chest tube" who found that more than three quarters of the studied nurses were married .

Regarding qualification and years of experience, the current study illustrated that nearly half of the studied nurses had diploma education. This might be due to that the majority of the nursing manpower in Egypt graduated from diploma school. So, number of nurses graduated from diploma schools is higher than bachelor graduated nurses and more than one third of them had experience of 5<10year in nursing, this might be due to half of studied nurses were aged range from 25-30 years old.

These results go in the same line with *Bedier,etal.,(2016)* [32] who reported that more than half of the studied nurses had diploma in nursing ,and about half of them had years of experience from 5<10year.But this result disagreed with *Ramya and Jose,(2013)* [24] who found that two thirds of the studied nurses had bachelor degree in nursing.

Concerning attendance of nurses training courses, the present study showed that nearly two-thirds of nurses had not attending any previous training courses about chest tube. From the researcher point of view, lack of training program may be due to lack of nurses' awareness about the importance of chest tub care, priority of nursing intervention and expected complication and also, increase wok over load could lead to lack time for nurses to participate on any training courses.

This result supported by *Mohammed etal.,(2016)*[23] in whose study about "Assessment the nurses' performance in providing care to patients undergoing chest tube in Suez Canal University Hospital" and reported that the majority of nurses had no previous training program about chest tube.

In the second part of this discussion regarding nurses' knowledge related to care of patient with chest tube pre /post and follow up self -learning module, the current study revealed that the majority of the studied nurses had unsatisfactory knowledge level pre SLM intervention, however, most of them had a satisfactory knowledge level post SLM intervention, but after three months follow up, there was slight decline in these results. This result may be due to half of the studied nurses had diploma in nursing, and their knowledge gained during school study years might be insufficient for such a specialized service and most nurses hadn't attending any training courses related to chest tube.

This result goes in the same line with **Ramya and Jose, (2013)** [24] who stated that a highly significant difference was found between the overall knowledge score of pre and post implementing SLM. This result also supported by **Bedier,etal.,(2016)** [31] who found that the majority of studied nurses had unsatisfactory knowledge about chest tube pre educational program intervention, while there was a highly statistically significant improvement immediately after program intervention in all nurses' knowledge score ,but at the first follow up, three months post program intervention, there was a decline in total knowledge.

Also, these results agreed with **Hamel and Ahmed, (2020)** [33] whose study was about "Effectiveness of an educational program on nurses' knowledge and practices regarding nursing interventions of chest tube drainage system in Ibn Alnafees Teaching Hospital" and reported that nurses' knowledge after implementing educational program was improved.

In relation to   nurses' knowledge items such as role of nurse during chest tube insertion, care of patient with under water seal system and role of nurse during accidental problem pre self -learning module intervention. The current study revealed that most of the studied nurses had incorrect answers pre self -learning module intervention, while first month post intervention most of them had correct answers related to those items, but after three months follow up there was slight decline in these results but still improvement in nurses 'knowledge was very high compared to pre-SLM intervention. With a highly statistical signification different between all items of knowledge pre, post and follow up.

This improvement might be related to the fact that majority of them are young and are enthusiastic to learn. In addition, the highly expressed needs of this group of nurses to learn more about certain areas like chest tube care.

This finding is congruent with **Mathew,(2019**[34] who studied" Effectiveness of structured teaching programs on care of patients with intercostal drainage among nurses" and reported that there was an improvement in the mean score of nurses' knowledge regarding chest tube insertion Knowledge regarding care of patients with chest tube drainage in post- test than pretest. Also ,this finding was supported by **Patidar,etal., (2021)**[35] who was studying "A Study to assess the effectiveness of self-instructional module on knowledge about practice regarding management of patient with chest tube drainage among nurses working at selected hospitals of North Gujarat " and presented that most of the nurses had poor knowledge regarding management of patient with chest tube drainage in pre-test and had improved to get extent after intervention which was revealed in post-test. This showed the self-instructional module had increase level of knowledge about practice regarding management of patient with chest tube drainage, and thus self-instructional module was proved to be effective.

As regard to total nurses' knowledge related to care of patient with chest tube pre /post and follow up self -learning module. The current study revealed a highly statistically significant improvement between the pre and post-test and follow up of nurses' knowledge regarding care of patient with chest tube and these findings are supporting the first research hypothesis. Also, these findings indicated nurses were in need for updating and refreshing their knowledge and that the SLM was effective in enhancing the knowledge of the nurses regarding care of patients with chest tube.

The third part of discussion was regarding total nurses' practices related to care of patient with chest tube pre /post and follow up self -learning module. The current study revealed a highly statistically significant improvement between pre and post-test of nurses' practices regarding care of patient with chest tube.

This result was in agreement with **Elsayed, etal., (2016)** [36] whose study was" Effect of implementing nursing management guidelines for patients with chest tube drainage on nurses' performance at Mansoura University Hospitals" who stated that concerning total nurses'

practice regarding management of patient with chest tube there was a marked improvement in nurses' practice after implementing the educational guidelines in comparison with their practice level before implementing the guidelines.

This result in a harmony with, *Atia (2017)*[37] whose study was "Effect of instructional module about central venous catheter on nurse's performance and patient outcomes in selected hospital" documented that there was increase in staff nurses adequate practice scores in the post test than that of pretest and the difference was statistically significant. This result also supported by *Salim and Shakweer,(2021)* [38] who studied "Effect of self-learning package on nurses knowledge and practices regarding patient care undergoing laparoscopic cholecystectomy" and reported that total nurses' practices was improved after implementing self - learning package and three months follow up .

Also, the present study findings revealed that minority of the studied nurses have adequate level of practices pre self- learning module intervention. This might be due to lack of knowledge regarding care of patient with chest tube, lack of system of supervision and evaluation of nursing practice, while one month post intervention, nearly half of them had adequate level of practices, but after 3 months follow up slight decline was observed in their level of practices.

This result agreed with *Bedier,etal.,(2016)* [32] whose study was "Impact of an educational program on nurses' practices related to care of patients with chest tube " and stated that there was a highly statistically significant improvement immediately after program intervention in all nurses' practices score, but at the first follow up, three months post program intervention, there was a decline in total practices, but still improvement in nurses' practice was very high compared to pre-program intervention. These findings are supporting the second research hypothesis.

Regarding the fourth part of discussion that the correlation coefficient between total knowledge and total practice during post and follow up self- learning module intervention, the current study revealed that there was appositive statistically significant correlation between total knowledge and total practices post and follow up SLM intervention with statistically significant difference at ($P<0.05$). This finding indicates that the self –learning

module was an effective intervention that affected nurses' knowledge which in turn improved their practices. This result supported the third hypothesis who supposed a significant positive correlation between nurses' knowledge and practice post implementing self-learning module.

This result supported by *Ali (2012)* [39] whose study was " Effect of self-learning module on nurses performance regarding electrocardiography" and stated that nurses who had satisfactory level of knowledge post phase had also, satisfactory level of practice post phase. But this results disagreed with *Mohammed etal.,(2016)*[23] who documented that there was no statistically significant relationship between nurses' knowledge and practice .

Regard to relation between socio-demographic characteristics and nurses' knowledge and practice pre/post and follow up self- learning module intervention. The results of the current study illustrated that there was no statistically relation between nurses' knowledge and socio-demographic characteristic in all items except in qualification, there was statistically significant relation at pre self -learning module intervention. Also, there was no statistically relation between practice and socio-demographic characteristic in all items except in qualification, there was statistically significant at 1st months post intervention (P< 0.05).

These results supported by *Mohammed etal.,(2016)*[23] who found that there was a significant relation between nurses' knowledge, practices and their qualification. But these results are inconsistent with *Bedier etal.,(2016)* [31),(32)) who reported that there was no statistically relation between nurses' knowledge, practice and their socio-demographic characteristics except in training courses, there was statistically significant relation. This finding is in disagreement with *Ramya and Jose, (2013)* [24] who reported no significant relation between pre -test knowledge score of nurses when compared to demographic variables.

Conclusion:

In the light of the study findings, it might be concluded that the majority of studied nurses had unsatisfactory knowledge and inadequate practices before SLM intervention, while they had satisfactory knowledge and adequate practices post SLM intervention, also, there was appositive statistically significant correlation between total knowledge and total practices post SLM intervention. Also, this finding means that SLM was an effective method

in improving and updating the knowledge and practice of staff nurses regarding nursing care of patient with chest tube.

Recommendation:

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

1- Self -learning modules (SLMs) should be developed by nurse educators as a learning source material available to staff nurses in clinical settings for learning at their own time and pace.

2- Build flexibility and create awareness among staff nurses about significance of self-directed learning.

3- Self -learning modules can be used for a larger population of staff nurses to improve their knowledge and practice and thereby reduce complications related to chest tube.

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الملخص العربى

مقدمة: تعتبرالرعاية التمريضيه لمرضى انبوبه الصدريه من أهم الإجراءات التمريضية لأن المرضى الذين يحتاجون إلى أنابيب صدرية عادة ما يكونون مرضى فى حاله خطيره ويحتاجون إلى رعاية تمريضية متقدمة. وبناءً عليه ، يمكن للرعاية التمريضية المتخصصة والجيدة أن تمنع حدوث مضاعفات خطيرة ، لذا فإن الرعاية التمريضية للمريض الذي يعاني من أنظمة الصرف الأنبوبي الصدري تحتاج إلى معرفة ومهارات فعالة ، لذلك يجب أن يكون التمريض على دراية ومهارة بممارسات نظام الصرف الأنبوبي الصدري. وتعتبر وحدة التعلم الذاتي ضرورة فعاله لمساعدة الممرضات على مواجهة التحديات المقدمة في بيئة الرعاية الصحية.

الهدف من الدراسة: هدفت هذة الدراسة الي تقييم تأثير وحدة التعلم الذاتي على أداء الممرضات فيما يتعلق برعاية مرضى الأنبوب الصدري. **نوع البحث:** تم استخدام تصميم شبه تجريبي.

مكان البحث: أجريت الدراسة بقسم الصدريه ووحدة العناية المركزة للصدر بمستشفى جامعة بنها.

عينه الدراسه؛ جميع الممرضين المتاحين (٥٠) الذين كانوا يعملون في الإماكن السابقة ووافقوا على المشاركة في الدراسة.

أدوات الدراسه: تم استخدام أداتين وهما؛١ -استبيان الممرضات الذي يملئ ذاتيًا لتقييم معرفة الممرضات فيما يتعلق برعاية المريض باستخدام أنبوب الصدر. **2**-اداة ملاحظة ممارسة الممرضات لتقييم مستوى ممارسة التمريض فيما يتعلق برعاية المريض باستخدام أنبوب الصدر ونظام التصريف تحت الماء.

النتائج: كشفت الدراسة أن ٤٦٪ كانوا في الفئة العمرية من ٢٥ إلى ٣٠ عامًا ، وأن ٤٨٪ من الممرضات حاصلات على دبلوم تمريض و ٣٦٪ لديهن خبرة تتراوح بين ٥-١٠ سنوات. فيما يتعلق بمستوى المعرفة الإجمالي للممرضات ، فإن ٤٪ منهم لديهم معرفه مُرضِيه قبل اعطاء وحدة التعلم الذاتى ، و بعد شهر واحد من التدخل ، كان ٩٦٪ منهم لديهم معرفه مُرضيه ولكن بعد ٣ أشهر ، كان هناك انخفاض طفيف إلى ٩٢٪ في مستوى المعرفة. فيما يتعلق بممارساتهم الإجمالية ، حصل ٦٪ منهم فقط على مستوى كافٍ قبل اعطاء وحدة التعلم الذاتى ، بينما حصل ٤٦٪ منهم على المستوى المناسب بعد شهر واحد من التدخل ، ولكن بعد ٣ أشهر انخفض بشكل طفيف إلى ٣٤٪ المستوى المناسب. **الخلاصة:** نستخلص من هذه الدراسة أن غالبية الممرضات لديهن معرفة غير مرضية وممارسات غير كافية قبل اعطاء وحدة التعلم الذاتى ، بينما كان لديهم معرفة مرضية وممارسات مناسبة بعد اعطاء وحدة التعلم الذاتى ، كما كان هناك ارتباط إيجابي ذو دلالة إحصائية بين مجموع المعرفة والممارسات الكلية بعد اعطاء وحدة التعلم الذاتى. وتعني هذه النتيجة أيضًا أن وحدة التعلم الذاتى كانت طريقة فعالة في تحسين وتحديث معرفة وممارسة الممرضات فيما يتعلق بالرعاية التمريضية للمريض باستخدام أنبوب الصدر. **التوصيات:** يجب تطوير وحدات التعلم الذاتي من قبل الممرضات المسؤلين عن التدريب كمصدر تعليمي متاح للممرضين العاملين في البيئات السريرية للتعلم في الوقت والوتيرة الخاصة بهم.

•خلق الوعي بين طاقم التمريض حول أهمية التعلم الذاتي.

•يمكن استخدام وحدات التعلم الذاتي لعدد أكبر من الممرضين العاملين لتحسين معرفتهم وممارستهم وبالتالي تقليل المضاعفات المتعلقة بأنبوب الصدر.