

Evaluation of Nurses Performance Regarding New Guidelines of Chest Drain

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Abstract

Background: Chest drain is a tube inserted through the chest wall between the ribs and into the pleural cavity to allow drainage of air, blood, and fluid or pus out of the chest. **Aim:** The study aimed to evaluate nurses' performance regarding new guidelines of a chest drain. **Design:** A descriptive exploratory research design was utilized in this study. **Sample:** Two samples were taken. First sample Includes group (A) of 56 patients with a chest drain, and group (B) included all available nurses working in cardiothoracic and chest ICUs (35) nurses . **Setting:** the study was conducted at cardiothoracic and chest ICUs in Mansoura University Hospital, which includes 45 beds. **Data Collection:** 1) Patient assessment questionnaire composed of three parts, this tool filled by the researcher from patient files and from inspecting the patients. 2) Nurses' self-administered questionnaire composed of two parts. 3) Nurses' practice observational checklist composed of two parts. **Results:** 94.3% of studied nurses got unsatisfactory level of knowledge, 71.4% of the studied nurses got satisfactory level of practice regarding new guidelines of a chest drain in ICU. **The main results:** There was a strong positive statistically correlation between nurses' total level of practice and their total level of knowledge. **Conclusion:** Less than third of the studied nurses got satisfactory level of knowledge regarding new guidelines of chest drain in ICU. On the other hand, more than two thirds of the studied nurses got satisfactory level of practice regarding new guidelines of chest drain in ICU. **Recommendations:** Increase the number of nurses staff because nurses shortage affect patient outcomes and Encourage nurses to attend online courses and workshops regularly about new guidelines of chest drain, Also developing booklet by simple language about new guidelines of chest drain for nurses who provide care for patients with a chest drain .

keywords: Chest Drain, Guidelines, Nurses, Performance.

Introduction:

Chest drain is a tube inserted through the chest wall between the ribs and into the pleural cavity to allow drainage of air (pneumothorax), blood (haemothorax), fluid (pleural effusion) or pus (empyema) out of the chest. The effective drainage of air, blood or fluid from the pleural space requires an adequately positioned drain and an airtight one-way drainage system to maintain sub-atmospheric intrapleural pressure. This allows the drainage of the pleural contents and re-expansion of the lung. In the case of a pneumothorax or haemothorax, this helps restore hemodynamic and respiratory stability by optimizing ventilation perfusion and minimizing

the mediastinal shift (*Adlakha, Roberts & Ali, 2018*).

Nursing care of chest drain aim 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 tubes to prevent tension pneumothorax, water aspiration and monitoring patient to prevent risk of complications. In addition to encourage patients to take responsibility for their chest drain and drainage system (*El-Faramawy et al., 2020*).

The nurse checks the patient for signs and symptoms of respiratory distress and pain at the insertion site. Sudden pressure or increased pain indicates potential complications. In addition, the patient may report pain at the insertion site and request medication for pain (Eckstein, & Henderson, 2019).

The nurse assesses and observe the insertion site for redness, swelling, or drainage during changing the dressing. Report any signs of infection to the physician. Assess for subcutaneous emphysema surrounding insertion site of a chest drain. The nurse must assess the amount and types of fluid drainage, measure drainage output at the end of each shift or as required by marking the level in the collecting chamber or placing a small piece of tape at the drainage level to indicate the date and time (Hudak, & Gallo, 2019).

Nursing care involves a variety of functions, skills, and responsibilities that are important in assessing, understanding and supporting the patient. Assessing the patient for medical history or injury. Medical history provides the etiologic basis for the occurrence of pneumothorax, empyema, pleural effusion, or chylothorax these are indicated for chest drain insertion (Samuel, 2019).

National Health Society Guidelines (2019) for chest drain are intended to be used in all clinical areas of hospitals where chest drains are placed. They cover indications for chest drain insertion, the technique of insertion, care for drain and drainage system, and drain removal. These guidelines bring together information from other national and international guidelines including the British Thoracic Society (BTS) (2015) Pleural disease guideline and the Advanced Trauma Life Support (ATLS)(2015) manual and the Agency for Clinical Innovation (2016) (James & Sarah, 2019).

Significance of the study:

Chest drains are frequently inserted into patients with different conditions, and nurses frequently deal with them. According to the literature, Chest drains were needed for more than a million adults in the Republic of Yemen for one year 2019. Among 893 patients in ICUs who required invasive procedures in one year, 150

(16.7%) had chest drain inserted. Furthermore, In Jordan during a six-month period in one hospital, there was 300 adults who had an inserted chest drain. (Kesieme, Essu, Arekhandia, Welcker, & Prasadov, 2019).

Aim of the study:

The aim of the study is to evaluate nurses' performance regarding new guidelines of chest drain

Research questions

- 1.What is the nurses' level of knowledge regarding new guidelines of chest drain?
- 2.What is the nurses' level of practice regarding new guidelines of chest drain?

Subjects and Methods:

I. Technical design

Research Design:

The descriptive exploratory research design was utilized to achieve the aim of the present study. The descriptive exploratory design is defined as adescription of new situations, events, or concepts, examine relationships among variables. It is concerned with phenomenon of interest and focuses on a single group of population characteristics without trying to make interference (Grove & Gray, 2019).

Research Settings:

The study was conducted at cardiothoracic and chest ICUs in Mansoura University Hospital, it includes three ICUs each one containing 15 beds.

Subjects:

There were two samples.The first sample (Group A) composed of a purposeful sample of 56 adult patients connected with a chest drain was included in the study. Patients were enrolled according to the following inclusion and exclusion criteria.

Inclusion criteria:

Adult patients. Both gender. Patients connected with a chest drain.

Exclusion criteria:

Patients admitted through the emergency room. Patients with malignancy of any organ.

Patients with any neurological disorders that affect the respiration.

The sample size calculated according to **Steven equation, (2012)**.

$$n = \frac{N \times p (1 - p)}{N - 1 \times (d^2 \div z^2)} + p (1 - p)$$

Description:

$$n = \frac{2200 \times 0.04 (1 - 0.04)}{2200 - 1 \times (0.0025 \div 3.8416)} + 0.04 (1 - 0.04)$$

$$n = 56$$

The second sample (group B) is a convenient sample includes all available nurses working in the previously mentioned setting (35) nurses.

Tools of the study:

Tool I: Patient assessment questionnaire

This tool was concerned with the demographic characteristics and clinical data of the patients connected with a chest drain. It was adapted and modified by the researcher based on reviewing the most recent and relevant literature and guided by (**Patricia, 2019; Buth & Hirsch, 2018**). The tool filled by the researcher from patient files and from inspecting the patients (after taking permission from the senior nurse). The tool was consisted of three parts.

Part one: Patients demographic characteristics data such as (age- gender- occupation- education)

Part two: Patients clinical data

Part three: Chest drain clinical data

Tool II: Nurses' Self-Administered Questionnaire:

It was used to evaluate nurses' level of knowledge regarding new guidelines of a chest drain, it was adapted and modified by the researcher based on reviewing the most recent and relevant literature and guided by (**BTS Pleural Disease Guideline, 2016 ; James & Sarah, 2019**). The questionnaire consisted of

42 questions in the form of 22 multiple choices questions (MCQ), 20 true/false questions.

❖ **Scoring system**

Regarding the scoring system of the nurses' questionnaire: included 42 questions. The response for each question was each correct answer was given one mark and the incorrect answer was given zero. The total scores for the whole knowledge assessment questionnaire were summed up (42 marks). The percentage of the total scores was calculated and then categorized as follows

- $\geq 80\%$ = satisfactory level of knowledge which equals ≥ 34 marks.

- $< 80\%$ = unsatisfactory level of knowledge which equals < 34 marks.

Tool III: Nurses' practice observational checklist:

It was used to evaluate nurses' practice regarding the application of new guidelines of a chest drain, it was adapted and modified by the researcher based on reviewing the most recent and relevant literature and guided by (**BTS Pleural Disease Guideline, 2016 ; James & Sarah, 2019**). It included a subsection observational checklist and consisted of 73 steps divided into two parts

Part one: : chest drain insertion and care consisted of (56) steps

❖ **Scoring system**

Scoring system, each step that was done correctly was given one mark and each step that was not done was given zero. The total score for the whole eight sections of the Nurses' practices observational checklists (56 steps) is as follows:

- $\geq 80\%$ = satisfactory level of practice which equals ≥ 46 marks.

- $< 80\%$ = unsatisfactory level of practice which equals < 46 marks

Part two: problems of chest drain consisted of (17) steps

❖ **Scoring system:**

Scoring system, each step that was done correctly was given one mark and each step that

was not done was given zero. The total score for the whole three sections of the Nurses' practices observational checklists (17 steps) is as follows:

- $\geq 80\%$ = satisfactory level of practice which equals ≥ 12 marks.
- $< 80\%$ = unsatisfactory level of practice which equals < 12 marks

Operational Design:

Preparatory Phase:

It included reviewing current and past, national and international related literature and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals, and magazines to develop tools for data collection.

Pilot Study:

A pilot study was carried out in the ICU department of Mansoura University Hospital on 10% (four nurses) of the nurses under the study and 10% (five patients) of the patients under the study to test the applicability, clarity, feasibility of the tools used in the study and to determine the time needed to answer the study tools. The nurse and the patients were included in the pilot study were included in the study sample because no modifications were done after conducting the pilot study.

Fieldwork:

After explaining the aim of study the researcher starting to collecting data using the study tools. All the available subjects (35 nurses & 54 patients) were included in the study. The researcher started to collect the data using data collection tool. Data collection took about one year starting from the beginning of February 2019 until the end of February 2020. The data were collected by the researcher four days per week (Saturday, Sunday, Wednesday, and Thursday) in the morning shifts (from eight A.M to three P.M) at the ICU department of Mansoura University Hospital.

III. Administrative Design:

An official letter was issued from the faculty of nursing Ain Shams University to the medical and nursing director of Mansoura University Hospital. And the medical and nursing director of ICU department at which the study was conducted, and explaining the purpose of the study.

Ethical considerations:

The ethical research considerations in this study included the following:

- The research approval was obtained from the scientific ethical committee in faculty of nursing, Ain Shams University before starting the study.
- The researcher clarified the objective and aim of the study to the nurses and patients included in the study before starting the study.
- The researcher assured maintaining anonymity and confidentiality of the subjects' data that were included in the study.
- Nurses were informed that they were allowed to choose to participate or not in the study and they had the right to withdraw from the study at any time without any reason.
- Consent was obtained from nurses to participate in the study.

IV. Statistical Design:

Data were collected, revised, coded, and entered into the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution was found parametric. Also, qualitative variables were presented as numbers and percentages.

The comparison between groups regarding qualitative data was done by using the Chi-square test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as follows:

- $P > 0.05$: Non significant (NS).
- $P < 0.05$: Significant (S).

Results:

Table (1): Demonstrates that 57.1% of the studied nurses ages ranged between (20-<30) and 51.4% of them were females. 42.9 % of studied nurses were holding bachelor degree and 45.7% of them years of experience ranged between (1-5) years. Also, 85.7% of the studied nurses didn't

attend training courses regarding chest drain management in ICU.

Table (2): Shows the distribution of the studied nurses knowledge level regarding chest drain, it was noticed that more than half (57.1% & 51.1%) of the studied nurses had satisfactory knowledge regarding definition of chest drain & preparations for chest drain insertion respectively, on other hand, the studied nurses (91.4%, 85.7% & 80.0%) had unsatisfactory knowledge regarding other items such as problems associated with chest drain, actions done immediately after insertion of chest drain, causes for insertion chest drain & underwater seal bottle respectively. According to the total knowledge level of nurses, the table shows that more than two-third (77.0%) of the studied nurses had unsatisfactory knowledge

Figure (1): Shows distribution of the studied nurses about their total knowledge level regarding chest drain, it presented that more than two-third (77.0%) of the studied nurses had unsatisfactory knowledge

Table (3): Shows distribution of studied nurses related their practice level regarding new guidelines of chest drain, presented that (45.7%, 42.9%) respectively of the studied nurses do the steps of patient preparation, monitoring and observation, flushing a chest drain, on the other hand, less than three quarters (71.4%) of them didn't do the steps of chest drain suction and chest drain bottle knocked over. According to the nurses total level of practice, the table shows three fifths (60.0%) of the studied nurses had unsatisfactory practice level and (40%) of them had satisfactory practice level regarding new guidelines of chest drain.

Figure (2): Shows distribution of studied nurses related their total practice level regarding new guidelines of chest drain, it was

noticed that three fifths (60.0%) of the studied nurses had unsatisfactory practice level and (40%) of them had satisfactory practice level regarding new guidelines of chest drain

Table (4): Shows relation between demographic data and total knowledge of nurses regarding new guidelines of chest drain in ICU, showed that there was a highly statistically significant relation between total knowledge among studied nurses and their degree and courses at p value ($<0.01^{**}$) (that's mean when nurses degree and courses decrease the total knowledge of the nurses will decrease). Moreover, there was a statistically significant relation between total knowledge and their age and years of experience with p value (0.016^{*} & 0.011^{*}) respectively (that's mean when the nurses age and years of experience increased the total knowledge level of nurses increased). On the other hand, there was no statistically significant relation between total knowledge among studied subjects and their gender at p value (0.064).

Table (5): Reveals relation between demographic data and total practice of nurses regarding new guidelines of chest drain in ICU, showed that there was a highly statistically positive significant relation between total practice among studied nurses and their degree and courses at p value ($<0.01^{**}$). Moreover, there was a statistically significant relation between total practice and their gender, age and years of experience with p value (0.025^{*} , 0.018^{*} & 0.011^{*}) respectively.

Table (6): Illustrates that, there was strong positive significant correlation between nurses' total level of knowledge and their total level of practice ($P \leq 0.01$). (when the total knowledge level decrease the total practice level also decrease).

Table (1): Percentage distribution of the studied nurses according to their demographic characteristics (n=35).

ITEMS		N	%
Gender	Male	17	48.6%
	Female	18	51.4%
Age (years)	20-<30	20	57.1%
	30-<40	10	28.6%
	40<50	4	11.4%
	50 or more	1	2.9%
Qualification	Nursing diploma	5	14.3%
	Technical institute	15	42.9%
	Bachelor	15	42.9%
Years of experience	1-<5	16	45.7%
	5-<10	15	42.9%
	10 or more	4	11.4%
Previous Courses	No	30	85.7%
	Yes	5	14.3%

Table (2): Percentage distribution of the studied nurses about their knowledge level regarding chest drain (n=35).

Items	Satisfactory		Unsatisfactory	
	N	%	N	%
Definition of chest drain	20	57.1	15	42.9
Causes for insertion chest drain	10	28.8	25	72.2
Places of chest drain insertion	7	20.0	28	80.0
Problems associated with chest drain	3	8.6	32	91.4
Preparations for chest drain insertion	18	51.4	17	48.6
Complication of chest drain	14	40.0	21	60.0
Actions done immediately after insertion of chest drain	5	14.3	30	85.7
Under water seal bottle	7	20.0	28	80.0
Suction and cleaning of chest drain	9	25.7	26	74.3
Removal of chest drain	11	31.4	24	68.6
Total knowledge level	8	22.9	27	77.1

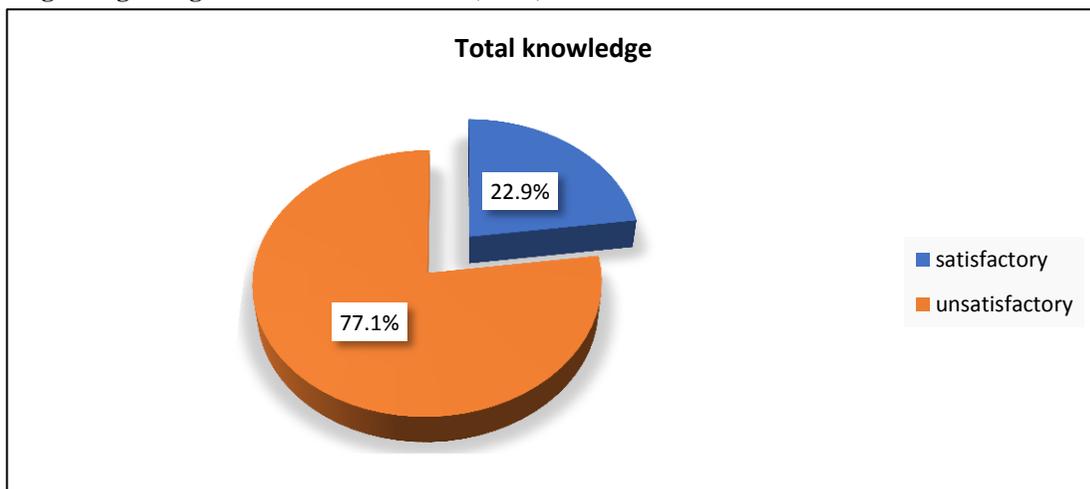
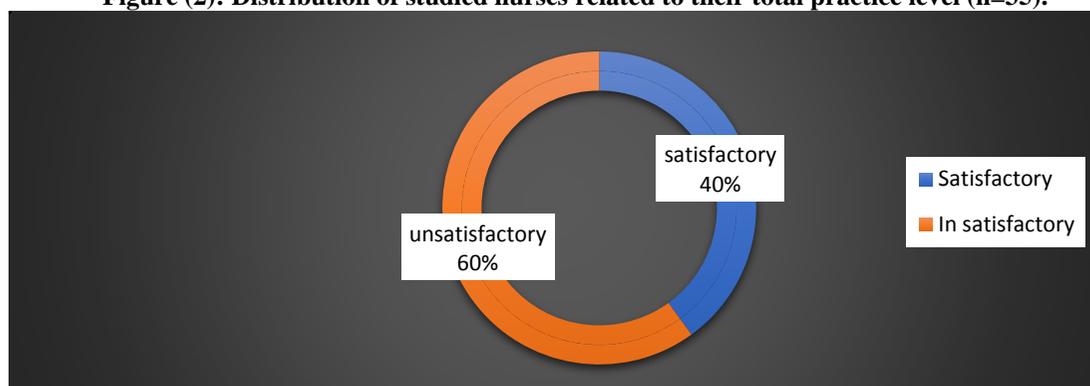
Figure (1): Distribution of the studied nurses about their total knowledge level regarding new guidelines of chest drain (n=35)

Table (3):Percentage distribution of studied nurses related to their practice level regarding new guidelines of chest drain (n =35).

Items	satisfactory		unsatisfactory	
	N	%	N	%
Patient Preparation	16	45.7	19	54.3
Chest Drain After Care	14	40.0	21	60.0
Chest Drain Bottle Care	13	37.1	22	62.9
Monitoring and Observation	16	45.7	19	54.3
Flushing a Chest Drain	15	42.9	20	57.1
Changing a Chest Drain Bottle	11	31.4	24	68.6
Chest Drain Suction	10	28.6	25	71.4
Chest Drain Removal	12	34.3	23	65.7
Drain has fallen out	15	42.9	20	57.1
Chest Drain Bottle Knocked Over	10	28.6	25	71.4
Soaked dressing or loose sutures	13	37.1	22	62.9
Total practice	14	40	21	60

Figure (2): Distribution of studied nurses related to their total practice level (n=35).**Table (4):** Relation between demographic data and total knowledge of nurses regarding new guidelines of chest drain in ICU (n=35).

Items		Total knowledge				X ²	P value
		Satisfactory N=8		Unsatisfactory N= 27			
		N	%	N	%		
Gender	Male	3	37.5	14	51.9	1.605	0.064
	Female	5	62.5	13	48.1		
Age (years)	20-<30	5	62.5	15	55.6	5.704	0.016*
	30-<40	3	37.5	7	25.9		
	40<50	0	0	4	14.8		
	50 or more	0	0	1	3.7		
Qualification	Nursing diploma	1	12.5	4	14.8	11.256	0.001**
	Technical institute	1	12.5	14	51.9		
	Bachelor	6	75	9	33.3		
Years of experience	1-<5	4	50	12	44.4	6.331	0.011*
	5-<10	2	25	13	48.2		
	10 or more	2	23	2	7.4		
Previous Courses	No	3	37.5	27	100	13.800	0.000**
	Yes	5	62.5	0	0		

*significant <0.05 **highly significant >0.05

Table (5): Relation between demographic data and total practice of nurses toward new guidelines of chest drain in ICU (n=35).

Items	Total practice				X ²	P value	
	satisfactory N=14		unsatisfactory N=21				
	N	%	N	%			
Gender	Male	9	64.3	8	38.1	4.999	0.025*
	Female	5	35.7	13	61.9		
Age (years)	20-<30	9	64.3	11	52.4	5.327	0.018*
	30-<40	4	28.6	6	28.6		
	40<50	1	7.1	3	14.3		
	50 or more	0	0	1	4.7		
Qualification	Nursing diploma	1	7.1	4	19.1	10.790	0.001**
	Technical institute	3	21.4	12	57.1		
	Bachelor	10	71.5	5	23.8		
Years of experience	1-<5	7	50	9	42.9	6.713	0.011*
	5-<10	6	42.9	9	42.9		
	10 or more	1	7.1	3	14.3		
Previous Courses	No	9	64.3	21	100	15.003	0.000**
	Yes	5	35.7	0	0		

*significant <0.05 **highly significant >0.05

Table (6): Correlation between total knowledge score and total practice score.

Total Practice score		
Total Knowledge score	r.	0.634
	P	<0.01**

*significant <0.05 **highly significant >0.05

Discussion:

Nursing care of patients connected to chest drains can either be pre procedural or postprocedural. Pre procedural care involves ensuring that informed consent is obtained and giving additional relevant information to the patient, gathering the correct materials for tube thoracostomy and assisting the procedure, Postprocedural care entails monitoring vital signs, maintaining a closed system, assessing and charting drainage, protecting the water seal drainage system, assisting patients during change of position and assisting in removing tube after it has served its function (Lu et al., 2018).

The present finding revealed that more than half of the studied nurses ages ranged (20-<30) years. From the researcher's point of view, this result may be due to the majority of nurses' work power providing direct care for the patient in nursing field in our study young age while

higher age category 'senior nurses' perform administrative role, The finding is in disagreement with study by **Mohammed et al., (2016)** who conducted study " Assessment the nurses performance in providing care to patients undergoing chest tube in Suez Canal university hospital" and stated that about three-quarters of the studied nurses their ages less than 25 years old.

Concerning gender, the present study illustrated that more than half of the studied nurses were female. From the researchers' point of view, this result may be due to the fact that the study of Nursing in the Egyptian was exclusive to females only till few years ago, so the profession of nursing in Egypt was mostly feminine. These results matched with the study performed by **Elsayed, Hassanin & Mohammed, (2016)** titled "effect of implementing nursing management guidelines for patients with chest tube drainage on nurses

performance at Mansoura university hospitals", at Egypt with sample size 50 nurses and stated that the majority of studied nurses were female.

Regarding qualifications of the studied nurses, the findings of the present study illustrated that, nearly half (42.9%) of the studied nurses were technical nursing institute's graduates. This finding was supported by the finding of **Buraihi & Mohammed, (2017)** in a study about "Effectiveness of an Educational Program on Nurses Knowledge Concerning Prevent of Post-Thoracic Surgery Complications at AL-Najaf Teaching Hospitals "in Iraq and demonstrated that, the highest percentage of the study sample are nursing technical institute graduates. On other hand, this finding disagreed with **Shaker et al., (2018)** who carried out "Knowledge, attitude, and clinical skill of emergency medical technicians from Tehran emergency center in trauma exposure" and found that about half of nurses had bachelor's degree in nursing.

According to Previous Courses, the present study found that the majority of nurses didn't have Previous Courses concerning chest drain care. This outcome matched with **Mohamed & Elhanafy, (2019)** who conducted a study about "The Effect of a Structured Training Program on Intensive Care Nurses Performance" and showed that the majority of their study subjects from ICU nurses' didn't receive any specific course ". From researcher's point of view, this result might due to the continuous shifting of nurses and over load roster and most of the courses not for free. So, they have not had the opportunities to attend continuous training courses during working hours.

At the point of nurses' knowledge about the definition of a chest drain, the present results demonstrated that more than half of the studied nurses got a satisfactory level of knowledge in the definition of a chest drain. These results may be due to these questions being considered basic and primary information, and it is easy to answer it. These results are inconsistent with the study done by **Mohammed et al. (2016)** titled "Assessment the Nurses Performance in Providing Care to Patients Undergoing Chest Tube" in Suez Canal University Hospital, at Egypt with a sample size of

70 nurses and detected that three-quarters of studied nurses had unsatisfactory knowledge related chest tube.

The current study also found that more than three-quarters of studied nurses got an unsatisfactory level of knowledge about care immediately after insertion of a chest drain. These results explained as three-quarters of studied nurses not attend training courses related to chest drain. The results agree with the study by **Choudhary & Singh (2020)**; "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 Malawi Region of Punjab, with sample size 30 nurses and indicated that less than half of nurses had poor knowledge about management of chest drain.

As regared nurses' knowledge about removal of a chest drain, the present results revealed that the majority of studied nurses had a satisfactory knowledge about removal of chest drain. These results are inconsistent with the study performed by **Mathew, (2019)** titled "Effectiveness of structured teaching program on the care of patients with intercostal drainage among nurses", with a sample size of 60 nurses and detected that most of the studied nurses had poor knowledge about removal of a chest drain.

Concerning total score of the studied nurses' knowledge toward new guidelines of chest drain in ICU, the present study showed that less than one quarter of the studied nurses had satisfactory level of knowledge toward new guidelines of chest drain in ICU and rest of them had unsatisfactory level of knowledge. The results might be due to the majority of nurses not attended training courses and only more than one third had Bachelor of Nursing. This outcome matched with **Elsayed, Hassanin & Mohammed, (2016)** who conducted study about "effect of implementing nursing management guidelines for patients with chest tube drainage on nurses' performance at Mansoura university hospitals" and presented less than one third of the studied nurses had poor knowledge regarding chest tube.

On other hand, this result disagreement with **Tufail et al., (2018)** who conducted study about "Knowledge of Nurses Regarding Chest Drain Care at Public Tertiary Care Hospital Lahore" and showed that all entire of all studied sample had unsatisfactory knowledge regarding chest tube. Also, this result inconsistent with **Magner et al., (2017)** who conducted study about "Nurses' knowledge of chest drain management in an Irish Children's Hospital" and showed that 88% of nurses had sufficient knowledge of chest drain care. From researcher point view, this difference between studies might be due to the available resources as a developed country with well-established guidelines

According to the point of nurses' practice about patient preparation, the current study demonstrated that all of the studied nurses had a satisfactory practice about Patient identification, explaining the procedure to the patient, obtaining written consent & confirming drainage of fluid/air post-insertion. Also, more than half had competent practice-related total about patient preparation. These results supported the study performed by **Joanisse (2020)** about "Evaluation of a Standardized Nurse-Led Chest Tube Removal Protocol", with sample size of 25 nurses and stated that the majority of studied nurses had competent practice for preparing the patient and complete assessment. On other hands, this finding disagreed with **Jeffries, (2019)** in his study titled "Evidence to Support the Use of Occlusive Dry Sterile Dressings for Chest Tubes" and showed that more than half of the studied nurses had incompetent practice related total procedure about patient preparation.

Concerning the nurses' practice of Analgesia according to medical prescription, the present study revealed that more than one-third of the studied nurses got a satisfactory level of practice in the following items as Analgesia according to medical prescription. This result matched with **Zedan et al., (2021)** who conducted a study about "Practice of Nurses Caring for Patients with Accidental Chest Trauma during Emergency Period: Effect of Educational Guidelines" and presented that more than one-third of the studied nurses had

competent practice regarding Analgesia according to medical prescription.

Regarding the practice level of the studied nurses about Chest Drain Bottle Care, the current study showed that the entire studied sample had got a satisfactory level of practice regarding the bottle kept below the level of the insertion site. This result agrees with **Gurney, (2019)** who conducted a study about "Tension Pneumothorax: What Is an Effective Treatment" and revealed that the majority of the study sample had competent practice regarding the bottle kept below the level of the insertion site.

The nurses total practice level regarding application of new guidelines of chest drain, the present study noticed that three fifths of the studied nurses had unsatisfactory practice level and rest of them had satisfactory practice level regarding application of new guidelines of chest drain. This result similar to **Maarouf, & Ameen, (2021)** who conducted study about "Influence of Care Protocol on Nurses' Performance and Clinical Outcomes for Patients with Tube Thoracostomy" and showed that less than one quarter of the studied nurses had satisfactory practice level and rest of them had unsatisfactory practice. Conversely, this finding contrast with the study conducted by **Hamel & Ahmed (2020)** about "Effectiveness of an Educational Program on Nurses' Knowledge and Practices Regarding Nursing Interventions of Chest Tube Drainage System in Ibn Alnafees Teaching Hospital", who revealed that more than half of studied nurses had inadequate practice related chest drain.

The present study showed that there was a highly statistically significant relation between total knowledge among studied nurses and their Qualification and Previous Courses at p-value ($<0.01^{**}$). Moreover, there was a statistically significant relation between total knowledge and their age and years of experience with p-value (0.016^{*} & 0.011^{*}) respectively. On the other hand, there was no statistically significant relation between total knowledge among studied nurses and their gender at p value (0.064). These results cohort with the study performed by **Kesieme et al., (2019)** entitled "nurses'

knowledge of care of chest drain" and found that there was a statistically significant relation between total knowledge among studied subjects and their educational level and training courses on their knowledge level about chest drain.

On other hand, this finding is in disagreement with a study by **AL-gabri, Mohamed, & Ali, (2019)** entitled "Assessment of Nurses' Performance Regarding Care Of Chest Trauma Patients at Trauma Emergency Unit" and showed that there was no relationship between the total score of nurses' knowledge and their Qualification, Previous Courses and years of experience with p-value (>0.05).

Relation between socio-demographic data and total practice score of nurses, the current results showed that there was a highly significant relation between nurses' age, experience, and educational level and Previous Courses and with their practice level. This outcome in the same line with **Bedier, Elata, & Ibrahim, (2016)** who conducted a study about "The impact of an educational program on nurses, practice related to care of patients with chest tube" and revealed that there was a significant relationship between their practice level and their training courses, on other hands, These result is in contrast with the study by **AL-Gabri, Mohamed, & Ali, (2019)** about "Assessment of Nurses' Performance Regarding Care of Chest Trauma Patients at Trauma Emergency Unit", with sample size of 40 nurses and reported that there was no significant relationship between nurses' characteristics and their practice level with p-value >0.05 .

Correlation between total knowledge score and total practice score, the current study reported that there was statistically significant correlation between nurses' total level of practice and their total level of knowledge ($P >0.05$). These results matched with the study by **Mohammed et al. (2016)** about "Assessment the Nurses Performance in Providing Care to Patients Undergoing Chest Tube in Suez Canal University Hospital", with sample size 70 nurses and showed there was no correlation between nurses, knowledge and practice.

Moreover, the study result was agreement with the findings of the research study done by **Abdelaziz, et al., (2016)** entitled "Assessment the Nurses Performance in Providing Care to Patients Undergoing Chest Tube in Suez Canal University Hospital" whom stated that there was no statistically significant relationship between nurses' knowledge and practice.

On other hand, the study result was contradicted with the findings of the research study done by **Maarouf, & Ameen, (2021)** entitled "Influence of Care Protocol on Nurses' Performance and Clinical Outcomes for Patients with Tube Thoracostomy" and stated that there was statistically significant relationship between nurses' knowledge and practice. From the researcher point of view this correlation because most of nurses are bachelor degree.

Conclusion:

Based on the present study and research questions it can be concluded that:

The current study concluded that less than third of the studied nurses got a satisfactory level of knowledge regarding new guidelines of chest drain in ICU. Meanwhile, more than two thirds of the studied nurses got satisfactory level of practice regarding new guidelines of chest drain in ICU.

Recommendations:

In the light of the findings of the current study the following recommendations can be suggested:

1. Encouraging nurses to attend online courses and workshops regularly about new guidelines of chest drain.
2. Developing periodical nurses' evaluation system to determine their knowledge and enhancing their practice.
3. Developing booklet by simple language about new guidelines of chest drain for nurses who provide care for patients with a chest drain .
4. Increase the number of nursing staff because the shortage affect patient outcome.

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