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Effects of Nursing Guidelines on Pain, Hemodynamic State and Pulmonary Complications after Thoracotomy

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Abstract : ***Background:*** *Nursing care after thoracic surgery is very important to help preventing pulmonary complications. Intercostal tubes are usually used after cardio-thoracic surgery to drain air or blood from pleural and mediastinal spaces to maintain hemodynamic stability, and also to maintain cardio-respiratory function.* ***Aim:*** *The aim of the study is to determine the effect of implementing nursing guidelines on pain, hemodynamic state and pulmonary complications after thoracotomy.*

Design: *A quasi experimental design will be used to conduct this study. This study will be conducted at cardiothoracic intensive care unit at Main Mansoura University Hospital. The study will include patients who are undergoing thoracotomy operation. The calculated sample size of the study was 100.*

Tools of the study*: Data will be collected using the following tools:* ***1-*** *Socio-demographic data Sheet, intercostal drain assessment.* ***2-*** *Hemodynamic assessment.* ***3-*** *Pain scale. 4- Laboratory Findings Form.*

Result: *The present study revealed that there was a statistically significant difference between both groups as intercostal drain in 70% of patients in study group and 50% of control group had been removed pre or within the third day postoperatively (X^2=4.167, p 0.041).In relation to oxygen saturation after performing the guidelines, the values showed highly significant increase (p<0.001) in third day between both groups. As regard to white blood count, the mean values of WBC concentration in the study group showed highly significant decrease (p< 0.001) in the third day.*

Conclusion: Applying nursing care guidelines were more effective to reduce postoperative pulmonary complications after thoracotomy in study group versus control group who received routine hospital care. *Combination of early activity and chest physiotherapy improve the outcome of patients after open heart surgery. Performing early activity to such patients is recommended.*

Keywords*: Guidelines, pain, hemodynamic state, pulmonary complications, thoracotomy.*

I. INTRODUCTION

Thoracotomy is a major surgical procedure requiring a thorough understanding of cardio respiratory maintenance of very vital organs function such as the heart and lungs. It requires not only skilled doctors and anaesthesiologists, but also requires postoperative high dependency environment with full physiological monitoring capabilities and trained, well-experienced nursing staff. **(Akutsu & Matsubara, 2009) .**

A basic need with each thoracotomy operation is insertion of an intercostal drain which needs specific and very important care**.** The intercostal drain is a flexible catheter inserted through the chest wall and into the pleural space, to remove fluid or air. This removal will allow normal intra-pleural and intra-pulmonic pressure to resume so that normal lung function can occur. **(Julie Reid, et al, 2010).** Thoracic surgery impairs postoperative respiratory function resulting in a relatively high risk of developing postoperative pulmonary complications (PPCs) which include, but are not limited to atelectasis, consolidation, pulmonary collapse, decreased mucociliary clearance, abnormal gas exchange, and a decrease in functional residual capacity (FRC) **(Agostini & Singh 2009; Reeve et al, 2010; Reid et al, 2010).**

Postoperative pulmonary complications are a major cause of morbidity after thoracotomy, resulting in patient discomfort, prolonged length of hospital stay, and increased health care costs. Thoracotomy can also lead to long-term restriction of shoulder function and range of motion, reduced muscle strength, chronic pain, and reduced health-related quality of life **(Julie Reid, et al, 2010**)**,** So that postoperative nursing care is playing an important role to reduce these complications.

Physiotherapy treatment post-thoracotomy usually focus on prevention of pulmonary complications during the acute recovery phase and improvement of thoracic and shoulder mobility by range of motion exercise (ROM)**.** Physiotherapy treatment modalities include airway clearance techniques such as deep breathing exercises (DBE), using incentive spirometry (IS), active cycle of breathing technique (ACBT), manual chest clearance techniques e.g. percussions and body positioning **(Reeve, Denehy & Stiller, 2007).**

II-SUBJECT AND METHODS

1- Research Design

A quasi experimental design was utilized.

2- Participants

Adult patients aged from 20 to 60 year. The researcher met patients at cardiothoracic intensive care unit at Main Mansoura University Hospital. The study included patients underwent thoracotomy operation. The calculated sample size of the study was 100.

2.1 Inclusion criteria*:*

Adult (20:60 years old), had one chest tube at least in the instant postoperative phase, both sexes (male & female), able to communicate verbally, and agreed to participate in the study.

2.2 Exclusion criteria*:*

Patients suffered from chronic lung diseases or any psychological disorders.

3- Structured Interview Questionnaire

3.1 Socio-demographic:

It will include socio-demographic characteristics of the patients such as age, sex, level of education, marital status, residence and type of surgery. Part B: Intercostal drain Assessment: This part includes type of surgery, number of intercostal drains, duration of intercostal drain, time of intercostal drain removal and wound assessment.

3.2 Hemodynamic Assessment:

This tool was used to assess hemodynamic and vital signs changes which include (temperature, respiratory rate, heart rate, central venous pressure and both systolic and diastolic blood pressure).

3.3 Pain Scale:

Visual analog scale (VAS) was used to assess each patient pain intensity.Visual analog pain scale (VAS) graded from very happy, no hurt (0), hurts just, a little bit (2), hurts a little more (4), hurts even more (6), hurts a whole lot (8), hurts as much as you can imagine (don't have to be crying to feel this much pain) (10). According to pain scale and pain intensity, the patient is being assessed to take sedation or analgesia. This tool is assessed third day postoperatively.

3.4 Laboratory Findings Form:

This part includes changes in blood pictures (red blood cells, white blood cells, hemoglobin, hematocrit and platelets. It also includes changes in oxygen saturation (Sa O2) from arterial blood gases (ABGs).

4- Operational Design: The operation design includes preparatory phase, validity, reliability, pilot study and field work which include data collection (assessment phase, planning phase, implementation phase and evaluation phase).

4.1. Preparatory Phase: It included reviewing of related literature, and theoretical knowledge of various aspects of the study using book, articles, internet, periodicals and magazines to develop the theoretical part of the study and data collection tools.

4.2. Validity:

The validity of the proposed tools was achieved through face and content validity. This stage was achieved through a jury of 5 experts; in the field of medical surgical nursing two of them were assistant professor and three lecturers at the faculty of Nursing. The tools were reviewed for clarity, relevance, comprehensiveness, understanding, applicability and simplicity for implementation and some modification were applied accordingly.

4.3. Reliability: The reliability of proposed tools was done by using Cronbach's Alpha and was in knowledge part (alpha= 0.874) which is very good.

4.4. Pilot Study: A pilot study was conducted on 10 %(ten patients) post thoracotomy admitted to the postoperative intensive care unit (ICU) to test the feasibility and clarity of the tools. These selected patients doesn't included in the main study sample. The necessary modifications were done prior to data collection

4.5. Field of work: The study was implemented through the following four phases:

4.5.1. Preparatory Phase (Assessment phase):

The researcher introduced herself to the study sample and gave them a brief idea about the aim of the study.

Verbal consent approval was obtained from each participating patient prior to her/his inclusion into the study.

Clarification of the nature and purpose of the study was on the interview with each patient. The researcher emphasized participation was absolutely voluntary and confidential. Anonymity, privacy, and confidentiality were absolutely assured throughout the whole study and the right to withdraw from the study at any time.

4.5.2. Planning phase:

The general objective of the educational guideline:

At the end of implementing this guideline, the patients are expected to be able to perform guidelines that help him in reducing pain and pulmonary complications after thoracotomy operation.

The specific objectives of the educational guideline:

1- Encourage the patient to assume a comfortable position with good body alignment.
2- Improve his chest and breathing by coughing and breathing exercises.
3- Practice range of motion exercise for the affected arm and shoulder several times daily.
4- Teach the patient how to use the incentive Spirometer.
5- Maintain chest free from any secretions.

4.5.3 Implementation phase:

a- The educational guideline was implemented for the study group individually. It was conducted in 4 sessions; each session took about 20 to 30minutes.
b- During each session the researcher used easy, concise and clear words. At the end of each session, a short summary was given by the researcher.
c- The researcher showed each patient the educational booklet to attract his attention, motivate him, and help him to assume guidelines correctly.
d- First day postoperative, the patient was encouraged to do simple range of motion exercise. Second and third day ,the patient encourage to get out of bed, walk for small distances , perform coughing and breathing exercise, use spirometer correctly.
e- Data collection covered a period of six months, started from the first of May 2015 to the end of October 2015, 3days a week at the morning and afternoon shifts.

4.5.4 Evaluation phase:

Each patient in the study group was interviewed after applying educational guidelines sessions to assess his knowledge. Each patient was assessed how to do deep breathing and coughing, and how to use incentive spirometer.

III-RESULTS

Table (1): As regard age, the table shows that patients aged 20-30 years were 16% in control group compared to 30% in study group; aged 46-60 were 44% in control group compared to 24% in study group .There is no statistical significant difference was detected between two groups regarding age. (X^2=5.281, p 0.071). .Although there were more males than females in control group constituting 54%. While the females were more than males in study group constituting 54%. There is no statistical significant difference was detected between two groups regarding sex. (X^2=0.640, p 0.424) .With regard to educational level, read and write prevailed 12%among the control group and 26% of the study group. While university level prevailed 46% of control group and 36% of study group, with no statistical significant difference was detected between two groups regarding educational level. (X^2=3.289, p 0.193) .Majority of the patients in control and study groups (70% and 50% respectively) was married.

Table (2): Clarifies that, half of the patients in control and study groups (50% and 56% respectively) had two intercostal drains. And 18% of control group and 13% of study group had only one intercostal drain (X^2=1.226, p 0.542). In relation to duration of intercostal drain, it was found that, there was a significance difference between both groups as intercostal drain in 70% of patients in study group and 50% of control group had been removed pre or within the third day postoperatively (X^2=4.167, p 0.041). In relation to wound assessment it was found that wound of 60% of study group and 36% of control group was good (X^2=14.229, p 0.076). It was founded that there is no significance difference between both groups in relation to number of intercostal drain and wound assessment ($p>0.05$).

Table (3): Shows that, in the first day, heart rate significantly decreased ($p<0.001$) between study group versus control group (98.51±14.37& 81.90±15.85) respectively and also there is a significant decrease between both groups in the third day (93.54±13.67&84.27±13.75) respectively. There was highly significant decrease in respiration between study group compared to control group ($p< 0.001$) (16.74±1.43&15.03±1.88) respectively, also there is a significant decrease between the two groups in the third day (13.91±1.01&14.06±1.23) respectively. According to blood pressure, it shows significantly decrease in systolic BP in study group versus control group in third day. There is no significant difference of mean values central venous pressure in both groups in the first day but show highly significance in the third day.

Table (4): Clarifies that, there was no statistically significance difference in control and study group regarding pain with breathing, wheezing, dyspnea, orthopnea, coughing, sputum, hemoptysis and Crackle ($p>0.05$). But in relation to oxygen saturation, the values showed highly significance increase ($p<0.001$) in third day between both groups (90.24±2.07&94.52±1.64) respectively, which mean that chest is clear and lungs inflate well.

Table (5): Shows that, there is no significant deference was found in both groups as regard to pain assessment using visual analog pain intensity score. Concerning pain control analgesia postoperatively results reveals that majority of patients (88%) not administered drug in study group and (34%) in control group .Also results revealed that percentage of patient who received sedation or analgesia were (12%) in study group and (66%) in control group.

Table (6): The result revealed significant decrease in temperature in study group versus control group ($p<0.001$) (37.51**±0**.34&38.45**±0**.22). As regard to white blood count (WBC) the mean values of WBC concentration in the study group showed highly significantly decrease ($p< 0.001$) in 3rd day (7.99±3.08) while there was significance increase at control group (7.99±3.08).Also the consistency and amount of intercostal drain show highly significant decrease in 2nd &3rd day.

Table (1): Demographic Characteristics of Control and Study Group.

n=100

Items	Control group n=50		Study group n=50		X^2	p-value
	No	**%**	**No**	**%**		
Age						
20-30	8	16	15	30.0	5.281	.071
31-45	20	40	23	46.0		
46-60	22	44	12	24.0		
Sex						
Male	27	54.0	23	46.0	.640	.424
Female	23	46.0	27	54.0		
Level of education						
Read and write	6	12.0	13	26.0	3.289	.193
Secondary school	21	42.0	19	38.0		
University	23	46.0	18	36.0		
Marital status						
Single	4	8.0	11	22.0	7.492	.058
Married	35	70.0	25	50.0		
Divorced	3	6.0	8	16.0		
Widow	8	16.0	6	12.0		
Residence						
Rural	35	70.0	36	72.0	.049	.826
Urban	15	30.0	14	28.0		

Table (2): Comparison between Control and Study Group Regards Intercostal drain and Wound Assessment.

n=100

Items	Control group n=50		Study group n=50		X^2	p-value
	No	**%**	**No**	**%**		
Number of intercostal drains						

1 Tube	18	36.0	13	26.0	1.226	.542
2 Tubes	25	50.0	28	56.0		
3 Tubes	7	14.0	9	18.0		
Duration of intercostal drain in place						
≤3 Days	25	50.0	35	70.0	4.167	.041*
>3 Days	25	50.0	15	30.0		
Wound assessment						
Good	18	36.0	30	60.0	14.229	.076
Redness	6	12.0	2	4.0		
Painful wound	12	24.0	3	6.0		
Red streaks coming from wound	1	2.0	3	6.0		
Fever	3	6.0	2	4.0		
Blood, fluid or pus draining from wound	1	2.0	0	0		
Bad odor	3	6.0	2	4.0		
Swelling	4	8.0	3	6.0		
Oozing from wound	2	4.0	5	10.0		

Table (3): *Comparison of Hemodynamic Data and Vital Signs on First and Third Day Postoperatively Between Control and Study Group.*

n=100

Items	control group (n=50)		Study group (n=50)		Test of sig. p-value
	1st Day	3 rd Day	1st Day	3 rd Day	
Heart Rate	81.90±15.85	84.27±13.75	98.51±14.37	93.54±13.67	P1= ≤.001** p3=.001*
Paired t	P=.023*		P2=.003*		
Respiratory Rate	15.03±1.88	14.06±1.23	16.74±1.43	13.91±1.01	P1=≤.001** p3=.057*
Paired t	P=.012*		P2=≤.001**		
Diastolic Blood Pressure	76.74±6.58	77.38±4.97	77.70±9.82	77.49±6.51	P1=.567 p3=.922
Paired t	P=.499		P2=.875		
Systolic Blood Pressure	127.74±10.33	127.88±10.39	125.10±13.83	120.38±7.33	P1= .282 p3=≤.001**
Paired t	P=.913		P2=.012*		
Central Venous Pressure	3.26±1.04	4.62±.957	3.26±1.77	6.71±1.92	P1=.982 p3=≤.001**
Paired t	P=≤.001**		P2=≤.001**		

Table (4): *Third Day Postoperative Evaluation of Respiratory System in Control and Study Groups.*
n=100

Items	Control group n=50		Study group n=50		X^2	p-value
	No	**%**	**No**	**%**		
Pain with breathing	19	38.0	17	34.0	3.788	.804
Wheezing	8	16.0	9	18.0		
Dyspnea	6	12.0	9	18.0		
Orthopnea	3	6.0	2	4.0		
Coughing	5	10.0	5	10.0		
Sputum	7	14.0	4	8.0		
Hemoptysis			2	4.0		
Crackle	2	4.0	2	4.0		

	1st Day	3 rd Day	1st Day	3 rd Day	
Sao2	89.77±2.65	90.24±2.07	93.21±2.16	94.52±1.64	P1=.366 p3=.001**
Paired t	P=.029*		P2=≤.001**		

Table (5): *Comparing Pain Intensity and Pain Control Analgesia between Control and Study groups Third Day Postoperatively.*
n=100

Items Pain intensity	Control group n=50		Study group n=50		X^2	p-value
	No	**%**	**No**	**%**		
Hurts just ,a little bit	8	16.0	1	2.0	6.285	.279
Hurts just ,a little bit	0	0	10	20.0		
Hurts a little more	10	20.0	14	28.0		
Hurts even more	14	28.0	16	32.0		
Hurts a whole lot	14	28.0	5	10.0		
Hurts as much as you can imagine	4	8.0	4	8.0		
No drugs	17	34.0	44	88.0	30.643	≤.001**
Sedation or analgesia	33	66.0	6	12.0		

Table (6): Effectiveness of Standard Nursing Care on Reduction of Pulmonary Complications.
n=100

Items	Control group (n=50)		Study group (n=50)		Test of sig. p-value
	1st Day	**3 rd Day**	**1st Day**	**3 rd Day**	
Temperature	37.85±**0**.43	38.45±**0**.22	37.68±**0**.42	37.51±**0**.34	P1=.062 p3=.317
Paired t	P=.112		P2=≤.001**		
White blood cells	9.14±3.98	7.99±3.08	8.71±3.38	7.99±3.08	P1= .554 p3=.047*

Amount of intercostal drain	120.5±51.2	56.4±23.37	68.66±23.17	34.05±15.48	P1=≤.001** p3=≤.001**
Paired t	P=≤.001**		P2=≤.001**		
Consistency					
Bloody	50(100%)	0(0%)	48(96%)	0(0%)	P1= .495
Watery	0(0%)	39(100%)	2(4%)	24(100%)	
McNemar Test	P=≤.001**		P2=≤.001**		

IV- DISCUSSION

Discussion Of The Study Results Will Be Presented Within The Following Headings:

Socio-Demographic Characteristics of Studied Patients:

46% of the study group were aged 31:45 year while 44% of the control group were aged 46:60 year. Females were more than males in study group, while males were more than females in control group. Majority of the participants in study and control groups were married. The study and control groups were similar according to the area of residence.

Azer, Eldeen, Abd-Elwahab, and Ahmed (2011) reported that most age group seen in cardiac surgery ages ranged from 18-29 years and **Kaur, Verma, and Rana (2007)** reported that ages 16-35 years were seen in cardiac surgery. Another study showed that the mean age of patients in control and study group were 53.5 and 52.8 years, respectively **(Babaee, Kesavarz & Shayegan, 2007).** This may be due to fair of cardiac surgery in our culture so that performing operations may be delayed to older ages.

According to sex, the present study revealed that females were more than males in study group, while males were more than females in control group. Findings were found in the study of **Guo, East and Arthur (2012)** reported that more than half of cardiac surgeries were male. This may be due to work and stress.

In relation to marital status, the present study revealed that more than half of the participants were married. This agreed with **Azer et al.,(2011) and; Deyirmenjian, Karam and salsmeh (2006)** who reported that most of studies patients were married. This may be due to the delay of cardiac operation to older age. Moreover, in the present study, it was found that there were no significant differences in socio-demographic data between study and control groups. These findings were in line with **Azer et al., (2011) and Fredericks (2009)** who indicated that there was no statistical significant difference between study and control groups regarding socio-demographic variables.

The findings of present study revealed that there was statistically significant decrease in the duration of intercostal drain stay in the study group than control group. A study done by **Siamak, Khosrow, Arash (2008);and Erdal, Volkan, Cagatay, Gokcen (2008)** were in line with the current study as they founded that the mean time for removal of chest drains were lower in study group versus control group. Another related study revealed that placement of a intercostal drain for more than 3 days increase risk of infection which may reach around the lung **(Mcchal, Carlson, 2001).**

Assessment Of Hemodynamic State:

The present study revealed that heart rate and respiration showed significant decrease between the two groups in the third day. But blood pressure showed significantly decrease in systolic blood pressure only and there was no significance different in diastolic blood pressure. A study by **Naglaa, Mona, Mervat and Laila (2011)** experienced that there was highly significant decrease in respiration between study group compared to control group while blood pressure show significantly decrease in diastolic BP in study group versus control .On the other hand, **Ahmed et al. (2006)** was on line with this study, who reported that there was a postoperative significant increase in heart rate and systolic blood pressure and significant decrease in diastolic blood pressure postoperatively.

The Effect of the Guideline on Pain and Administration of Pain Controlled Analgesia:

According to pain assessment after surgery, this study revealed that following guidelines after thoracotomy (early ambulation or change patient position, deep cough and breathing and using incentive spirometer) lead to early intercostal drain removal, decrease pain and consequently decrease drug administration. This is in harmony with **Mueller, Tinguely and Tevaearai (2005)** who found that patients who had a intercostal drain in place on the second postoperative day had significantly higher pain levels than did patients who had their intercostal drains removed on the first day.

Smeltzer and Bare (2005) also reported that Pain after a thoracotomy may be severe, depending on the type of incision and the patient's reaction to and ability to cope with pain. Deep inspiration is very painful after thoracotomy. Pain can lead to postoperative complications if it reduces the patient's ability to make deep breathing and coughing. **Miller (2002)** also reported that Patients often experience acute pain after thoracic surgery. Postoperative pain can keep patients from participating in expected activities such as deep breathing and getting out of bed, which faster wellness and prevent postoperative complications.

As regard to drugs administered postoperatively, results of the present study showed that majority of patients in study group and one third in control group not administered drug .Also results revealed that percentage of patient who received sedation or analgesia were 12% in study group and 66% in control group. This is in harmony with a study of **Abramov, et al., (2005)** who founded that postoperatively demand for analgesics was lower in study group than control group that may be due to early chest tube removal after coronary artery bypass graft surgery.

Relation Between Spirometer Usage And Oxygen Saturation:

As regard to using incentive spirometer, the present study showed better improvement of oxygen saturation in the study group rather than in control group that may be attributed to the effect of incentive spirometer and breathing &coughing exercise in regular basis. This are in line with **Chiang, Cheng**, **Lin, sheng and Knohp (2000)** who reported that the use of incentive spirometer significantly increase chest wall expansion . This finding concedes with **Westerahl, et al., (2005)** showed that the patients performing deep breathing exercises and use incentive spirometer after coronary artery bypass grafting had significantly small atelectasis areas and better pulmonary function. **Freitas, Soares, Cardoso and Atallah (2008)** mentioned that incentive spirometer is a handheld mechanical device developed to encourage sustained maximal inspirations, encourage re-inflation of lung tissue and thus prevent or resolve atelectasis.

Agostini, Calvert, Subramanian and Naidu (2008) were in line with this study as they reported that after thoracic surgery incentive spirometer is a relatively good measure of lung function following thoracotomy and also suggest that incentive spirometer may be useful to assess respiratory recovery in the days after thoracic surgery.

The current study is in line with **Abd-Elkaream (2005**) who found better improvement in the mean of oxygen saturation (SaO2) and respiratory rate in study group compared with control group. **Pottery and perry (2007)** mentioned that when the patient inhales and cough the volume of air moving in his lungs increased, the alveoli open, promoting good oxygen carbon dioxide exchange resulting improvement in partial pressure of oxygen in arterial blood and the percentage of oxygen saturation of arterial blood. **Diabe Abdel-Fattah (2008)** emphasized that the importance of encouraging the patient to cough frequently, breathe deeply and repositioning the patient every 2 hours for early re-expansion of the lung and facilitate drainage.

Smeltzer and Bare (2008) reported that retained secretions are a threat to the thoracotomy patient after surgery. If the secretions are retained, airway obstruction occurs. This, in turn, causes the air in the alveoli distal to the obstruction to become absorbed and the affected portion of the lung to collapse. Atelectasis, pneumonia, and respiratory failure may result.

Factors Affecting Oxygen Supply:

As regard to factors affecting oxygen supply between study and control group, the present study revealed significant increase in mean oxygen saturation, value of hemoglobin, red blood cells, and platelets in study group versus control group.

These findings also were congruent with **Segal and Hunt(2000)** who mentioned that the nurse should monitor the level of hemoglobin and hematocrit at regular intervals during the postoperative period as Hemoglobin reflects oxygen carrying power of blood .When its level is reduced ,oxygenation is reduced an tissue repair is altered resulting in delayed healing. Furthermore, a study by **Mohammed and Ali (2002)** who reported that hemoglobin creates oxygen carrying molecules in erythrocytes that import the characteristics color of red blood cells enabling blood to transport 30 to 100 times more oxygen than it could.

This finding also supported with **Roberta, Kaplow, Sonya and Hardin (2007)** who added that monitoring of hemoglobin provides information's about the oxygen carrying capacity of the blood. **Morton and fontaine (2009)** supported that length of stay in ICU and hospital environment after cardiac surgery increased risk for sternal surgical site infection so patient should discharge to home as early as possible to avoid infection.

Effect of Implementing Nursing Care Guidelines on Reduction of Pulmonary Complications:

Concerning to the effect of implementation of standard nursing care on reduction of pulmonary complications, the present study revealed significant decrease in body temperature and white blood cells count in study group. This is in accordance with **Winters and Munro (2004)** who mentioned that assessment of temperature is a basic important parameter to monitor, as an elevated temperature is signal that the patient response to infection. **Gaini, KoldkJaer, Pedersen and Pedersen (2006)** who reported that other method that is commonly used to detect response to infection is measurement of white blood cell count.

Studies that assure role of guidelines on reduction of pulmonary complications, **Tang, Velissaris and Weeden (2002)** emphasized that elevation of the head of the bed and effective hand hygiene are strategies for minimizing the duration of ICU stay, such strategies with application of standard nursing care prevent development of nasocomial infection.

The study is in the line with those of **Morton, Fontaine, Hodak, and Gallo (2005)**; **Morton and Fontaine (2009)** who emphasized that after cardiac surgery the patient may experience pain resulting from the chest or leg incision. In addition **Osborn, Wraa, and Waston (2010)** illustrated that the goals of nursing management is a thorough assessment of the patient's pain using a pain scale, provide a calm environment, adequate period of rest and sleep, and administration of analgesics based on the report of pain intensity.

Mirmohammad, et al (2009) founded that in a study to assess the impact of the chest tube removal time following coronary artery bypass grafting surgery on the clinical outcome of the patients the mean time of intensive care unit stay was longer in the second group. **Light (2001)** mentioned that the fluid level in the underwater seal drain should be checked regularly and the level of drainage marked on the bottle each time, as therapeutic decisions are based on the quantity of drainage and its color and consistency. **Westerahl, Lindmark, Eriksson, Friberg, hedenstierna and Tenling (2005)**

reported that an important role of the nurse is to assess the chest tubes regularly every 2 hours for patency, fluctuation, a mount, consistency and character of drainage.

Ganzale, Adams, and Anderson (2003) found that physiotherapy are positively interfering with pain, respiration, oxygen saturation and also reduce the postoperative pulmonary complications. The nurse plays vital role in maintaining client normal respiration such as positioning to allow maximum chest expansion that enhance breathing and expectoration, as well as allowing full lung expansion and possibly preventing complications of prolonged immobilization, encouraging frequent position change and encouraging deep breathing and coughing . **(Joseph, porta, Cacui, Casiraghi, Maffies & Rossi, 2005)**.

Regarding post operative activities, **Charson and Islam (2003)** stressed that, following the cardiac surgery; the patient must be encouraged slowly to resume an active life, while minimizing the risk associated with excessive physical effort. On the other hand **Abdel Monem (2008); Gerald and Fletcher (2007)** illustrated that, active but not restrictive range of motion of extremities is also well tolerated early after cardiac surgery as long as activities do not stress or impair healing of sternal incision while patient become stable and early ambulated from bed. So we can accept for these hypotheses: A-patients who involved in nursing care guidelines (study group) will reduce pulmonary complications than those who do not (control group). B-there is significant difference between study and control group.

V-CONCLUSION

From the results of the present study, it can be conducted that:
1-Nursing care guidelines can help reducing post operative pulmonary complications.
2-Postoperative breathing exercises using incentive spirometer as a prophylactic for patient after thoracotomy surgery.
3-Combination of early activity and chest physiotherapy ameliorates the outcome of patients after open heart surgery. Performing early activity to such patients is recommended.

VI-RECOMMENDATION

Based on the finding of the current study, the following recommendations are suggested:

1) Postoperative early ambulation from bed or regular range of motion should be done as early as possible.
2) Deep cough and breathing exercise and deep breathing by using incentive spirometer to improve recovery
3) Investigate pain management among patients with intercostal drain should be made in a regular manner.

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