IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 7, Issue 1 Ver. VI. (Jan.- Feb .2018), PP 20-34
www.iosrjournals.org

The Effect of Using Incentive Spirometry on Postoperative Breathing Pattern among Abdominal Surgical Patients

1-Mrs .Walaa Jamaan Al-Harbi,2-Dr.Elham A. Nagshabandi,3- Prof.Aida E. ElGamil

1-(Medical Surgical Master's student ,Faculty of Nursing college, King Abdulaziz university, Jeddah)
2-(Associated Professor Medical Surgical Nursing, Faculty of Nursing college, King Abdulaziz university, Jeddah)
3-(Professor Medical Surgical Nursing , Faculty of Nursing college, King Abdulaziz university, Jeddah)

Abstract
Background: *Respiratory management including deep breathing with incentive spirometry is an integral part of the clinical management and health maintenance of abdominal surgical patients . Incentive spirometry known to prevent postoperative pulmonary complications ,enhancing patients recovery ,keep lungs healthy and improve quality of life after abdominal surgery. Breathing pattern can be changed causing serious postoperative pulmonary complications following abdominal surgery. Incentive spirometry improving impaired breathing pattern following abdominal surgery.* ***Aim:*** *To assess the effect of using incentive spirometry on postoperative breathing pattern among abdominal surgical patients.* ***Setting:*** *The study was carried out at inpatient surgical departments in the following hospitals(King Faisal Hospital, King Abdulaziz Hospital ,Hera General Hospital in Makkah).****Design:*** *A quantitative quasi experimental design was conducted.* ***Sample*** *: a convenience purposeful sampling of hundred patients was conducted and divided into two equal groups (control group=50) and (study group=50)Subjects* ***Method:*** *Control group received hospital pre and postoperative routine care and study group received an educational session about correct use of incentive spirometer preoperatively, receiving routine hospital care and practicing incentive spirometry postoperatively.* ***Tools*** *:interview questionnaire and breathing pattern clinical assessment checklist.* ***Results:*** *The study findings revealed that, there is no significance differences between the two groups at third day postoperatively ,whereas a noticeable improvement were observed from the first two days in the study group in relation to breathing patterns characteristics and vital signs with a recognizable significance differences between the two groups.* ***Conclusion:*** *Incentive spirometer use after abdominal surgery appear to be effective. As promoting greater diaphragmatic mobility, preventing postoperative pulmonary complications through maintaining normal breathing pattern, lung expansion and removal of retained secretions.*

Keywords: *incentive spirometer , incentive spirometry ,breathing pattern, abdominal surgery.*

Date of Submission: 15-01-2018 Date of acceptance: 09-02-2018

I. Introduction

Over the last decades, the number of abdominal surgical patients has been increased. Moreover, recent estimates indicated that millions of major abdominal surgical procedures have been performed worldwide each year (Istomnia, 2011: Jackboson et al, 2014). However, in England, there is an obvious increase in the incidence of hospital admission for cholecystectomy (Kanakala et al, 2011). In contrast, abdominal surgery associated by a higher risk for developing postoperative pulmonary complications (Naraynan et al,2016 ;Mohamady et al,2016 ;Rupp et al,2013) .

Consequently, many patients after abdominal surgery describe symptoms similar to breathing pattern disorder (Smith &Rowley, 2011). Patients after abdominal surgery inhibiting the abdominal expansion that is a part of breathing cycle, in order to reduce pain and protect tender wound incision. Thus encourage patient to use chest breathing that lead to shallow breathing pattern, increase risk of strain on the neck and shoulder muscles as well as hyperventilation (Pepper et al, 2012). Consequently, alterations in pattern of breathing after abdominal surgery may promote airway closure, reduced functional residual capacity, and hypoxemia and atelectasis formation. (Dias et al, 2008).

However, prolonged use of chest breathing and overuse of accessory muscles described as a part of postoperative pulmonary complications as may lead to excessive accumulation of pulmonary secretions and increase the risk of postoperative pulmonary complications(Colucci et al,2015)

In this context, strategies to improve the postoperative breathing pattern should be carried out .Currently, nurses were instructed to encourage their patients to use incentive spirometry postoperatively (Christie & Armstrong, 2017)

Problem and significance of the study

Despite the widespread use of incentive spirometry, some systemic reviews have found little evidence that supporting the use of incentive spirometry in prevention of postoperative pulmonary complications (Yamagutti et al, 2010). Evidences supporting the use of incentive spirometry are controversial due to varied methodologies and treatment protocols (Lange et al, 2011). The incentive spirometry has been used in 95% of hospitals in the United States (Sanjeev Khanna, 2013). At present, (IS) is used clinically as a part of the routine prophylactic and therapeutic regimen in perioperative respiratory care for patient undergoing abdominal surgery. (Apeksha O Yadav, 2014; Overend etal, 2011).

To the best of investigator knowledge, several medical and nursing studies has been conducted on the significance of implementing incentive spirometer after abdominal surgery. According to Naraynan et al., (2016) numerous research have been conducted to investigate the effectiveness of incentive spirometry after abdominal surgery. However, incentive spirometry remains a routinely used postoperative respiratory therapy in many health settings. Most of these studies have been published in Europe, Western and Asian countries as well as in the Middle East countries. In contrast, no study have been conduct in Saudi Arabia to the same purpose of the current study. So, the investigator was deiced to conduct this study.

Aim of the study:

To assess the effect of using incentive spirometer on postoperative breathing pattern among abdominal surgical patients.

Objectives:

1- To identify the significance differences between the control and study group in accordance to breathing pattern characteristics, over three days postoperatively.
2- To investigate the effect of using incentive spirometer on study group in accordance to breathing pattern characteristics, over three days postoperatively.

II. Research Methodology

3.2Aim of the study:

To assess the effect of using incentive spirometry on postoperative breathing pattern among abdominal surgical patients.

3.3Objectives:

1-To identify the significance differences between the control and study group in accordance to breathing pattern characteristics and vital signs ,over three days postoperatively.
2-To investigate the effect of using incentive spirometer on study group in accordance to breathing pattern characteristics and vital signs ,over three days postoperatively.

Null Hypothesis:

Abdominal surgical patients who have incentive spirometry will not show improvement on postoperative breathing pattern.

Research Hypothesis:

Abdominal surgical patients who have incentive spirometry will show improvement on postoperative breathing pattern.

Research Design:

A quantitative quasi experimental design was conducted to determine the effect of incentive spirometer for improving abdominal surgical patients outcomes. However, all patients undergoing elective abdominal surgery in study and control groups have a pre and postoperative breathing pattern assessment.

Study Setting:

For the purpose of this study, the inpatient surgical departments were chosen in three ministry of health general hospitals (King Faisal Hospital, King Abdulaziz Hospital ,Hera General Hospital in Makkah). However,

the patients exposed to the same pre and postoperative hospital and nursing routine care and the same types of abdominal surgeries.

Study Sample:

The researcher used a convenient purposeful sample method from three ministry of health general hospitals (King Faisal Hospital , King Abdulaziz Hospital ,Hera General Hospital in Makkah) to recruit preoperative abdominal surgical patients from the three mentioned hospitals.

Sampling Technique:

Hundred of patients were selected through convenient sampling based on inclusion criteria and then put into two equal groups. They were divided into control group (A) and study group(B), 50 patients in each group. Control group received hospital pre and postoperative routine care (early mobilization, deep breathing and coughing exercises, pain control, intravenous fluid, laboratory investigation, intake and output monitoring ,pre and postoperative medications and vital signs monitoring). On the other hand, Study group received a supervised educational session about the correct use of incentive spirometry preoperatively followed by incentive spirometry at the first three days postoperatively and receiving the same routine hospital care.

Inclusion and Exclusion Criteria:

Inclusion Criteria:

Age ranging from 18-65 years old, willing to participate in the study, receiving general anaesthesia, with controlled diabetes and hypertension, Scheduled for elective abdominal surgery.

Exclusion Criteria:

Patients with respiratory disease, Scheduled for Obstetric and Gynecological surgery, receiving spinal anaesthesia, Scheduled for emergency abdominal surgery.

Sample Size:

To detect the variation in the outcomes of the two groups ,the sample consisted of hundred abdominal surgical patients were gathered from three ministry of health general hospitals (King Faisal Hospital, King Abdulaziz Hospital and Hera General Hospital in Makkah), at admission during eight months from October 2016 to May 2017. The sample size was estimated according to the bed capacity of the inpatient surgical department at the previously mentioned hospitals . Moreover, the number of surgical clinical beds in each hospital are King Faisal hospital= 33 surgical clinical beds ,the amounts of surgical clinical beds in Hera General hospital at both male and female surgical departments is 60 beds ,the amounts of the clinical beds at both male and female surgical departments in King Abdul-Aziz hospital is 40 beds .

Sample size was estimated by using the Stephen Thomson equation with following parameters.

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

N= Population size =100 from 100 from 30 patients from King Faisal hospital (study group=15 &control group=15) ,30 patients from King Abdulaziz hospital (study group=15 &control group=15), 40 patients from Hera General hospital (study group=20 &control group=20)

z=Class standard corresponding to the level of significance equal to 0.95 and 1.96

d=Error rate equal to 0.05

p=Ratio provides a neutral property = 0.50

Study Tools:

There are two tools were used in the study.

Tool (1):An interview Questionnaire:

It was developed by the researcher to obtain the Sociodemographic data as age, sex , qualification , estimated length of stay, smoking habit ,history of respiratory disease , type of abdominal surgery as well as type of anaesthesia.

(2): Breathing Pattern Clinical Assessment Checklist:

It is an observational checklist that developed by the researcher after a comprehensive review of related literature ,to assess breathing pattern characteristics at preoperative and postoperative periods for both groups .However, this tool was divided into two parts:

Part I: vital signs(Temperature, respiratory rate, heart rate, blood pressure were obtained by noninvasive vital signs monitor and Abdominal pain score were obtained through numeric pain intensity scale**)**

Part II :Breathing Pattern Characteristics that include:

1- Respiratory depth through auscultation and inspection.
3- Respiration by assess the patient ability to breathe deeply and cough.
4- Respiratory rhythm through auscultation and inspection .
4- Breathing Sounds was obtained through auscultation.
5- Airway patency through inspection for tracheal tugging and saw breathing pattern.
6- Presences of productive and non-productive cough.
7- Skin color obtained through inspection and palpation.
8- Oxygen saturation(SPo2): was measured by non invasive pulse oximetry .
9- Nijmegen Score ; were categorized according to:
1- A grand total score of over 20 indicates significance hyperventilation.
2- A grand total score of between 10-20 suggests mild hyperventilation .
3- Below 10 indicate normal breathing pattern.

Ethical Approval:

Prior to conducting the study, official permission was obtained from the unit of Biomedical Ethics of king Abdul-Aziz university ,Ministry of Health and the faculty of nursing college, after submission of a proposal including the explanation of the aim ,methods ,and procedure of the study. Additionally, administrative approval was obtained from the selected hospitals for data collection

Validity and Reliability

The study tools developed by the researcher after reviewing related literature. The content validity of the constructed tools were revised by a jury of 5 experts in the field of medical surgical nursing, faculty of nursing ,King Abdul-Aziz university, to test the content validity ,completeness and clarity of items.
The reliability of the developed tool were estimated using the Cronbach's alpha through SPSS version22, it was 90% for all breathing pattern characteristics. The stress inventory was found to be highly reliable (14 items=.90)

Pilot Study:

A pilot study of the current study was undertaken over a 2 months period using the methodology of the main study. Patient's recruitment and data collection was anticipated to take 4 weeks. A sample size of 10% of the main study sample was used (n=10 patients). However, the intended objectives for the pilot study were to achieve: 1. validation of recruitment, and consent procedures; 2. confirmation of sample size for the main study; 3. confirmation of the inclusion/exclusion process; 4. testing the appropriateness of instruments used during the study.

Data collection plan:

The process of data collection was undertaken in the in patients surgical wards for the study and control group as follows:

A:Control group:

1-At six hours post-admission preoperatively.
2-At evening shift (7 p.m) over three days postoperatively.

B:Study group:

1-At six hours post-admission preoperatively.
2-At morning shift (7 a.m.) over three days postoperatively.
3-At evening shift (7 p.m.) over three days postoperatively.

However ,the investigator were observing study group while practicing the correct use of incentive spirometer at morning shift. Then follow up of study group was done by the investigator over three days postoperatively at morning and evening shifts to detect the effect of using incentive spirometer. Additionally, follow up of control group was done by the investigator over three days postoperatively. Every patients in control and study group were assessed using tool(2)(breathing pattern clinical assessment checklist).

Study Procedures:

Prior to conducting the study procedure abdominal surgical patients who fulfilled the inclusion criteria were selected and allocated either in control group (A) or study group(B) .After that, all selected patients either in control or study group were given a detailed explanation about the study aim and procedure ,and seek their

permission to sign the informed consent and informed that they have the right to withdraw from the study at anytime. However, the study procedures were divided according to preoperative and postoperative phases.

3.17.1 Preoperative Phase:

This phase was started at after six hours of patients admission for both groups and it is aimed at collect a preoperative baseline data for both groups in accordance to Sociodemographic data, vital signs and breathing pattern characteristics. Moreover, an educational session were established for the study about the correct use of incentive spirometer.

Postoperative Phase: This phase was completed over three days postoperatively and aimed at reassessment for both groups in accordance to postoperative breathing pattern characteristics and vital signs. Additionally, patients in study group practicing the correct use of incentive spirometer over three days postoperatively.

III. Study Results

The study results were presented as follows:

Table (4-1):=Distribution of socio-demographic characteristics of the study and control groups (n=100**)**

Socio-Demographic characteristics	Study (n = 50)		Control (n = 50)	
	No.	%	No.	%
Age (years)				
18 <25	8	16.0	11	22.0
25<35	4	8.0	7	14.0
35<45	4	8.0	8	16.0
45<55	4	8.0	10	20.0
55<65	30	60.0	14	28.0
Gender				
Male	20	40.0	21	42.0
Female	30	60.0	29	58.0
Educational Level				
Illiterate	5	10.0	4	8.0
12 years education (primary.intermediate,secondary)	22	44.0	20	40.0
university graduate	23	46.0	26	52.0
Type of abdominal surgery				
Upper abdominal surgery	41	82.0	36	72.0
Lower abdominal surgery	9	18.0	14	28.0
Smoking				
Non Smoker	50	100.0	50	100
Smoker	0	0	0	0
Number of abdominal surgical patients:				
King Faisal Hospital	15	30.0	15	30.0
King Abdulaziz Hospital	15	30.0	15	30.0
Hera General Hospital	20	40.0	20	40.0

Table(4-1) summarizes the distribution of Sociodemographic characteristics for the study and control groups. There were a total of 100 abdominal surgical patients included in this study, were divided into two equal group 50 abdominal surgical patients in the study group and 50 abdominal surgical patients in control group. It reveals that the highest percentage of patient's age were ranged between(55<65)years was (60%) in the study group .On the other hand ,the lowest percentage was only (8%) among age groups (25-35), (35-45) ,(45-55) years .

As regards to patient's gender, (60%) of study group were female while only (40%) were males. In relation to educational level the highest percentage were among university graduate (52%) in the control group while only (8%) were illiterate. According to type of abdominal surgery , the highest percentage were (82%) for upper abdominal surgery in the study group while only (18%) were lower abdominal surgery. With reference to smoking history, all patients(100%) in study and control groups were non- smoker. As regards to the distribution of control and study groups, (30%) were chosen from king faisal and king Abdulaziz hospitals as control and study groups while(40%) were chosen from Hera hospital as control and study groups.

Table (4-2): Comparison between the study and control groups according to pre operative vital signs**.**

Preoperative Vital Signs	Study (n = 50)		Control (n = 50)		χ^2	p
	No.	%	No.	%		
Temperature						
Normal	36	72.0	34	68.0		
Hypothermia	0	0.0	0	0.0	0.190	0.663
Hyperthermia	14	28.0	16	32.0		
Blood pressure						
Normal	33	66.0	34	68.0		
hypertension	17	34.0	16	32.0	0.045	0.832
hypotension	0	0.0	0	0.0		
Respiratory Rate						
Regular	33	66.0	34	68.0		
Tachypnea	17	34.0	16	32.0	0.045	0.832
Bradypnea	0	0.0	0	0.0		
Heart Rate						
Regular	33	66.0	32	64.0		
Tachycardia	17	34.0	16	32.0	0.044	0.834
Bradycardia	0	0.0	0	0.0		
Abdominal Pain rating						
No pain	32	64.0	31	62.0		
Moderate pain	13	26.0	14	28.0	0.053	0.974
Most worst possible pain	5	10.0	5	10.0		

χ^2, p: χ^2 and p values for **Chi square test** for comparing between the two groups

Table(4-2): illustrates the preoperative data for the study and control groups regarding the preoperative vital signs.. There were no statistical significant differences between the two groups in relation to preoperative vital signs respectively.

Table (4-3): Comparison between the study and control groups according to pre operative breathing pattern characteristics.

Preoperative Breathing Pattern characteristics	Study (n = 50)		Control (n = 50)		χ^2	p
	No.	%	No.	%		
Breathing Sound						
Normal	50	100.0	50	100.0		
Rales / ronchi	0	0.0	0	0.0	-	-
Stridor/wheezes	0	0.0	0	0.0		
Respiratory Depth						
Normal	33	66.0	34	68.0	0.045	0.832
Hyperpnoea	17	34.0	16	32.0		
Hypopnoea	0	0.0	0	0.0		
Respiratory Rhythm						
Regular	33	66.0	37	74.0	0.762	0.383
Irregular	17	34.0	13	26.0		
Paradoxical	0	0.0	0	0.0		
Respiration						
Ability to breathe deeply and cough	33	66.0	34	68.0	0.045	0.832
Limited respiratory effort (dyspnea)	17	34.0	16	32.0		
No spontaneous effort	0	0.0	0	0.0		
Oxygen saturation						
>95% on room air	32	64.0	32	64.0	0.0	1.000
95% on room air	18	36.0	18	36.0		
<95% on room air	0	0.0	0	0.0		
Patent airway						
Patent	50	100.0	50	100.0		
Tracheal tugging	0	0.0	0	0.0	–	–
See saw breathing pattern	0	0.0	0	0.0		
Cough						

None	50	100.0	50	100.0		
Productive	0	0.0	0	0.0	–	–
Non-productive	0	0.0	0	0.0		
Skin						
Normal	50	100.0	50	100.0		
Cyanosis	0	0.0	0	0.0	–	–
Pale	0	0.0	0	0.0		
Nijmegen score						
Significant hyperventilation (over20)	0	0.0	0	0.0		
Mild hyperventilation(10 – 20)	18	36.0	18	36.0	0.0	1.000
Normal breathing pattern (below10)	32	64.0	32	64.0		

χ^2, p: χ^2 and p values for **Chi square test** for comparing between the two groups

Table(4-3): reveals the preoperative data for the study and control groups regarding the preoperative breathing pattern characteristics.. There were no statistical significant differences between the two groups in relation to preoperative breathing pattern characteristics respectively.

Table (4-4): Comparison between the study and control group over the three days postoperatively according to vital signs during evening shift.

p: p values for **Chi square test** for comparing between the two groups

Postoperative Vital Signs	Postoperative (1st Day)					Postoperative (2nd Day)					Postoperative (3rd Day)				
	Study (n=50)		Control (n=50)		p	Study (n=50)		Control (n=50)		p	Study (n=50)		Control (n=50)		p
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Temperature															
Normal (36.5 - 37)	50	100.0	10	20.0	<0.001*	50	100.0	21	42.0	<0.001*	50	100.0	50	100.0	
Hypothermia	0	0.0	5	10.0		0	0.0	2	4.0		0	0.0	0	0.0	-
Hyperthermia (38)	0	0.0	35	70.0		0	0.0	27	54.0		0	0.0	0	0.0	
Blood pressure															
Normal (120/80)	50	100.0	12	24.0	<0.001*	50	100.0	20	40.0	<0.001*	50	100.0	50	100.0	
Hypertension	0	0.0	37	74.0		0	0.0	27	54.0		0	0.0	0	0.0	-
Hypotension	0	0.0	1	2.0		0	0.0	3	6.0		0	0.0	0	0.0	
Heart Rate															
Regular	50	100.0	20	40.0	<0.001*	50	100.0	46	92.0	MCp=0.117	50	100.0	50	100.0	
Tachycardia	0	0.0	28	56.0		0	0.0	4	8.0		0	0.0	0	0.0	-
Bradycardia	0	0.0	2	4.0		0	0.0	0	0.0		0	0.0	0	0.0	
Respiratory Rate															
Regular	50	100.0	10	20.0	<0.001*	50	100.0	20	40.0	<0.001*	50	100.0	50	100.0	
Tachypnea	0	0.0	38	76.0		0	0.0	26	52.0		0	0.0	0	0.0	-
Bradypnea	0	0.0	2	4.0		0	0.0	4	8.0		0	0.0	0	0.0	
Abdominal Pain Rating															
No pain)	50	100.0	0	0.0	<0.001*	50	100.0	21	42.0	MCp<0.001*	50	100.0	50	100.0	
Moderate pain	0	0.0	0	0.0		0	0.0	22	44.0		0	0.0	0	0.0	-
Worst possible pain	0	0.0	50	100.0		0	0.0	7	14.0		0	0.0	0	0.0	

*: Statistically significant at $p \leq 0.05$

Table(4-4): compares between the control and study groups over three days postoperatively regarding postoperative vital signs during evening shift after completing five cycles of incentive spirometry. It presents :

At day one postoperative : an obvious improvement in vital signs were observed over the first day postoperatively. Furthermore, this improvement shows a significant differences between both groups in relation to temperature (p=0.001) ,blood pressure(p=0.001), respiratory rate(p=0.001), heart rate(p=0.001), and abdominal pain (p=0.001) respectively. At day two ; a recognizable improvement in vital signs were observed over the second day postoperatively. Furthermore, this improvement shows a significant differences between both groups in relation to temperature (p=0.001) ,blood pressure(p=0.001), respiratory rate(p=0.001), heart rate (p=0.001), and abdominal pain (p=0.001) respectively. At day three postoperatively, An obvious improvement were observed in vital signs .However, this improvement did not show any significant differences between both groups.

Table (4-5): Comparison between the study and control group over the three days postoperatively according to postoperative breathing pattern characteristics during evening shift.

Postoperative Breathing Pattern characteristics	Postoperative (1st Day)					Postoperative (2nd Day)					Postoperative (3rd Day)				
	Study(n=50)		Control (n=50)		p	Study(n=50)		Control (n=50)		p	Study (n=50)		Control (n=50)		p
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Airway patency															
Patent	50	100.0	10	20.0		50	100.0	22	44.0		50	100.0	50	100.0	
Tracheal tugging	0	0.0	18	36.0	<0.001*	0	0.0	11	22.0	<0.001*	0	0.0	0	0.0	-
See saw breathing pattern	0	0.0	22	44.0		0	0.0	17	34.0		0	0.0	0	0.0	
Cough															
Non	50	100.0	3	6.0		50	100.0	18	36.0	MCp	50	100.0	50	100.0	
Productive	0	0.0	10	20.0	<0.001*	0	0.0	27	54.0	<0.001*	0	0.0	0	0.0	-
Non-productive	0	0.0	37	74.0		0	0.0	5	10.0		0	0.0	0	0.0	
Skin color	50	100.0	50	100.0		50	100.0	50	100.0		50	100.0	50	100.0	
Normal(pink)	0	0.0	0	0.0	-	0	0.0	0	0.0	-	0	0.0	0	0.0	-
Cyanosis	0	0.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Pale															
Oxygen saturation															
Able to maintain O2 more than 95% on room air (Normal (95%-100%)	50	100.0	0	0.0		50	100.0	14	28.0		50		50	100.0	
O2 sat =95% on room air(normal)	0	0.0	50	100.0	<0.001*	0	0.0	10	20.0	<0.001*	0	100.0	0	0.0	-
O2 sat less than 95% on room air	0	0.0	0	0.0		0	0.0	26	52.0		0	0.0	0	0.0	
												0.0			
Respiration															
Able to breathe deeply and cough	50	100	13	26.0		50	100	22	44.0		50	100	50	100	
Limited respiratory effort(dyspnea)	0	0.0	37	74.0	<0.001*	0	0.0	28	56.0	<0.001*	0	0.0	0	0.0	-
No spontaneous effort	0	0.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Respiratory Depth															
Normal	50	100.0	19	38.0		50	100.0	22	44.0		50	100.0	50	100.0	
Hyperpnoea	0	0.0	30	60.0	<0.001*	0	0.0	28	56.0	<0.001*	0	0.0	0	0.0	-
Hypopnoea	0	0.0	1	2.0		0	0.0	0	0.0		0	0.0	0	0.0	
Rhythm															
Regular	50	100.0	13	26.0		50	100.0	22	44.0		50	100.0	50	100.0	
Irregular	0	0.0	37	74.0	<0.001*	0	0.0	28	56.0	<0.001*	0	0.0	0	0.0	-
Paradoxical	0	0.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Breathing Sounds															
Normal	50	100.0	10	20.0		50	100.0	22	44.0		50	100.0	50	100.0	
Ronchi/ Rales	0	0.0	18	36.0	<0.001*	0	0.0	11	22.0	<0.001*	0	0.0	0	0.0	-
Wheezing/ Stridor	0	0.0	22	44.0		0	0.0	17	34.0		0	0.0	0	0.0	
Nijmegen Score															
Significant hyperventilation (over 20)	0	0.0	50	100.0		0.0	0.0	0	0.0		0	0.0	0	0.0	
Mild hyperventilation(10-20)	0	0.0	0	0.0	<0.001*	0	0.0	29	58.0	MCp	0	0.0	0	0.0	
Normal breathing pattern (below 10)	50	100.0	0	0.0		50	100.0	21	42.0	<0.001*	50	100.0	50	100.0	

p: p values for **Chi square test** for comparing between the two groups MC: **Monte Carlo** for Chi square *:

Statistically significant at $p \leq 0.05$

Table (4-5): compares between the control and study groups over three days postoperatively regarding postoperative breathing pattern characteristics during evening shift after completing five cycles of incentive spirometry .It indicates :

At day one postoperative ; a noticeable improvement in postoperative breathing pattern characteristics were observed over the first day postoperatively. Furthermore, this improvement shows a significant differences between both groups in relation to airway patency (p=0.001) ,cough (p=0.001), oxygen saturation (p=0.001), breathing sounds (p=0.001), respiratory depth (p=0.001) ,respiratory rhythm (p=0.001) , respiration (p=0.001) and Nijmegen score (p=0.001) respectively. At day two ; There were a general improvement in postoperative breathing pattern characteristics were observed during the second day postoperatively. Furthermore, this improvement shows a significant differences between both groups in relation to airway patency (p=0.001) ,cough (p=0.001), oxygen saturation (p=0.001), respiratory rhythm (p=0.001), respiratory depth (p=0.001) ,breathing sounds (p=0.001), respiration (p=0.001) and Nijmegen score (p=0.001) respectively. At day three postoperatively,. An obvious improvement were observed in postoperative breathing pattern characteristics at third day postoperatively. However, this improvement did not show any significant differences between both groups.

Table (4-6): Comparison between the morning and evening shifts over the three days postoperatively according to postoperative vital signs for the study group.

Postoperative Vital Signs	Postoperative (1st Day)					Postoperative (2nd Day)					Postoperative (3rd Day)				
	Morning shift (n=50)		Evening shift (n=50)		p	Morning shift (n=50)		Evening shift (n=50)		p	Morning shift (n=50)		Evening shift (n=50)		p
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Temperature															
Normal (36.5 - 37)	16	32.0	50	100.0		22	44.0	50	100.0		50	100.0	50	100.0	
Hypothermia	0	0.0	0	0.0	<0.001*	6	12.0	0	0.0	<0.001*	0	0.0	0	0.0	-
Hyperthermia (38)	34	68.0	0	0.0		22	44.0	0	0.0		0	0.0	0	0.0	
Blood pressure															
Normal (120/80)	16	32.0	50	100.0		25	50.0	50	100.0		50	100.0	50	100.0	
Hypertension	32	64.0	0	0.0	<0.001*	16	32.0	0	0.0	<0.001*	0	0.0	0	0.0	-
Hypotension	2	4.0	0	0.0		9	18.0	0	0.0		0	0.0	0	0.0	
Heart Rate															
Regular	0	0.0	50	100.0		22	44.0	50	100.0	MCp	50	100.0	50	100.0	
Tachycardia	31	62.0	0	0.0	<0.001*	19	38.0	0	0.0	<0.001*	0	0.0	0	0.0	-
Bradycardia	19	38.0	0	0.0		9	18.0	0	0.0		0	0.0	0	0.0	
Respiratory Rate															
Regular	16	32.0	50	100.0		26	52.0	50	100.0		50	100.0	50	100.0	
Tachypnea	30	60.0	0	0.0	<0.001*	22	44.0	0	0.0	<0.001*	0	0.0	0	0.0	-
Bradypnea	4	8.0	0	0.0		2	4.0	0	0.0		0	0.0	0	0.0	
Abdominal Pain Rating															
No pain	0	0.0	50	100.0		20	40.0	50	100.0	MCp	50	100.0	50	100.0	
Moderate pain	0	0.0	0	0.0	<0.001*	24	48.0	0	0.0	<0.001*	0	0.0	0	0.0	-*
Worst possible pain	50	100.0	0	0.0		6	12.0	0	0.0		0	0.0	0	0.0	

p: p values for **Chi square test** for comparing between morning and night shift
*: Statistically significant at $p \leq 0.05$

Table(4-6): clarifies the effect of incentive spirometer on postoperative vital signs by comparing the morning(pre-session) and evening (post session) shifts reading within the study group over three days postoperative.

At day one postoperative ; a noticeable improvement in postoperative vital signs were observed over the first day postoperatively. Furthermore, this improvement shows a significant differences between both shifts in relation to temperature (p=0.001) ,blood pressure(p=0.001), respiratory rate(p=0.001), heart rate(p=0.001), and abdominal pain (p=0.001) respectively.

At day two :a general improvement in postoperative vital signs were observed over the second day postoperatively. Furthermore, this improvement shows a significant differences between both shifts in relation to temperature (p=0.001) ,blood pressure(p=0.001), respiratory rate(p=0.001), abdominal pain(p=0.001), and heart rate (p=0.001) respectively.

At day three postoperatively, all patients(100%) at morning and evening shifts have normal vital signs. There were a noticeable improvement in postoperative vital signs were observed over the third day postoperatively. Furthermore, this improvement shows no significance differences between both shifts.

Table (4-7): Comparison between the morning and evening shifts over the three days postoperatively according to postoperative breathing pattern characteristics for the study group

Postoperative Breathing Pattern characteristics	Postoperative (1st Day)					Postoperative (2nd Day)					Postoperative (3rd Day)				
	Morning shift (n=50)		Evening shift (n=50)		p	Morning shift (n=50)		Evening shift (n=50)		p	Morning shift (n=50)		Evening shift (n=50)		p
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Airway patency															
Patent	16	32.0	50	100.0	<0.001*	41	82.0	50	100.0	MCp=0.002*	50	100.0	50	100.0	–
Tracheal tugging	0	0.0	0	0.0		3	6.0	0	0.0		0	0.0	0	0.0	
See saw breathing pattern	34	68.0	0	0.0		6	12.0	0	0.0		0	0.0	0	0.0	
Cough															
Non	16	32.0	50	100.0	<0.001*	19	38.0	50	100.0	<0.001*	50	100.0	50	100.0	-
Productive	10	20.0	0	0.0		31	62.0	0	0.0		0	0.0	0	0.0	
Non-productive	24	48.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Skin color															
Normal (Pink)	50	100.0	50	100.0	–	50	100.0	50	100.0	-	50	100	50	100	–
Cyanosis	0	0.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Pale	0	0.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Oxygen saturation															
Able to maintain O_2 more than 95% on room air	0	0.0	50	100.0	<0.001*	33	66.0	50	100.0	<0.001*	50	100.0	50	100.0	-
O2 sat =95% on room air	30	60.0	0	0.0		17	34.0	0	0.0		0	0.0	0	0.0	
O2 sat less than 95% on room air	20	40.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Respiratory Depth															
Normal	16	32.0	50	100.0	<0.001	26	52.0	50	100.0	<0.001*	50	100.0	50	100.0	-
Hyperpnoea	34	68.0	0	0.0		21	42.0	0	0.0		0	0.0	0	0.0	
Hypopnoea	0	0.0	0	0.0		3	6.0	0	0.0		0	0.0	0	0.0	
Respiratory Rhythm															
Regular	16	32.0	50	100.0	<0.001*	26	52.0	50	100.0	<0.001*	50	100.0	50	100.0	-
Irregular	34	68.0	0	0.0		24	48.0	0	0.0		0	0.0	0	0.0	
Paradoxical	0	0.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Breathing Sounds															
Normal	0	0.0	50	100.0	<0.001*	12	24.0	50	100.0	<0.001*	50	100.0	50	100.0	-
Ronchi/ Rales	16	32.0	0	0.0		18	36.0	0	0.0		0	0.0	0	0.0	
Wheezing/ Stridor	34	68.0	0	0.0		20	40.0	0	0.0		0	0.0	0	0.0	
Respiration															
Able to breathe deeply and cough	16	32.0	50	100.0	<0.001*	37	74.0	50	100.0	<0.001*	50	100	50	100	-
Limited respiratory effort(dyspnea)	34	68.0	0	0.0		13	26.0	0	0.0		0	0.0	0	0.0	
No spontaneous effort	0	0.0	0	0.0		0	0.0	0	0.0		0	0.0	0	0.0	
Nijmegen Score															
Significant hyperventilation (over 20)	20	40.0	0	0.0	<0.001*	7	14.0	0	0.0	MCp	0	0.0	0	0.0	
Mild hyperventilation(10-20)	30	60.0	0	0.0		29	58.0	0	0.0	<0.001*	0	0.0	0	0.0	-
Normal breathing pattern (below 10)	0	0.0	50	100.0		14	28.0	50	100.0		50	100.0	50	100.0	

p: p values for **Chi square test** for comparing between morning and evening shifts
MCp: p value for **Monte Carlo** for Chi square FEp**:** p value for **Fisher Exact** for Chi square test
*: Statistically significant at $p \leq 0.05$

Table(4-7): clarifies the effect of incentive spirometer on postoperative breathing pattern characteristics by comparing the morning(pre-session) and evening (post session) shifts reading within the study group over three days postoperatively.

At day one postoperative ; a recognizable improvement in postoperative breathing pattern characteristics were observed over the first day postoperatively. Furthermore, this improvement shows a significant differences between both shifts in relation to airway patency (p=0.001) ,cough (p=0.001), oxygen saturation (p=0.001), respiratory depth (p=0.001), respiratory rhythm (p=0.001), respiration (p=0.001), breathing sounds (p=0.001), and Nijmegen score (p=0.001) respectively.

At day two , a noticeable improvement in postoperative breathing pattern characteristics were observed over the second day postoperatively. Furthermore, this improvement shows a significant differences between both shifts in relation to airway patency (p=0.002) ,cough (p=0.001), oxygen saturation (p=0.001), respiratory rhythm (p=0.001),), respiratory depth (p=0.001), respiration (p=0.001), breathing sounds (p=0.001), and Nijmegen score (p=0.001) respectively.

At day three postoperatively, There were a general improvement in relation to postoperative breathing pattern characteristics were observed over the third day postoperatively. Furthermore, this improvement shows no significance differences between both shifts.

Table (4-8): Comparison between pre-operative data and the 3rd day postoperative for both groups according to pre&postoperative vital signs**.**

Vital Signs	Study (n=50)					Control (n=50)				
	Pre operative		3rd day postoperative		p	Preoperative		3rd day postoperative		p
	No.	%	No.	%		No.	%	No.	%	
Temperature										
Normal	36	72.0	50	100.0		34	68.0	50	100.0	
Hypothermia	0	0.0	0	0.0	<0.001*	0	0.0	0	0.0	<0.001*
Hyperthermia	14	28.0	0	0.0		16	32.0	0	0.0	
Heart Rate										
Regular	33	66.0	50	100.0		32	64.0	50	100.0	
Tachycardia	17	34.0	0	0.0	<0.001*	16	32.0	0	0.0	<0.001*
Bradycardia	0	0.0	0	0.0		0	0.0	0	0.0	
Blood pressure										
Normal	33	66.0	50	100.0		34	68.0	50	100.0	
hypertension	17	34.0	0	0.0	<0.001*	16	32.0	0	0.0	<0.001*
hypotension	0	0.0	0	0.0		0	0.0	0	0.0	
Respiratory Rate										
Regular	33	66.0	50	100.0		34	68.0	50	100.0	
Tachypnea	17	34.0	0	0.0	<0.001*	16	32.0	0	0.0	<0.001*
Bradypnea	0	0.0	0	0.0		0	0.0	0	0.0	
Abdominal Pain rating										
No pain	32	64.0	50	100.0		31	62.0	50	100.0	
Moderate pain	13	26.0	0	0.0	MCp <0.001*	14	28.0	0	0.0	MCp <0.001*
Most worst possible pain	5	10.0	0	0.0		5	10.0	0	0.0	

χ^2, p: χ^2 and p values for **Chi square test** for comparing between **Pre-operative**and**3rd day postoperative in** both groups

*: Statistically significant at $p \leq 0.05$

Table (4-8): compares between the preoperative and the third day postoperative regarding vital signs for both groups. Over all, a noticeable improvement in vital signs were observed over the third day postoperatively in both groups . However, this improvement shows a significant differences between both groups in relation to temperature (p=0.001) ,blood pressure(p=0.001), respiratory rate(p=0.001), heart rate (p=0.001) and abdominal pain (p=0.001) respectively.

Table (4-9): Comparison between pre-operative data and the 3rd day postoperative for both groups according to pre&postoperative breathing pattern characteristics**.**

Breathing Pattern characteristics	Study (n=50)					Control (n=50)				
	Pre operative		3rd day postoperative		p	Preoperative		3rd day postoperative		p
	No.	%	No.	%		No.	%	No.	%	
Respiration										
Ability to breathe deeply and cough	33	66.0	50	100.0	<0.001*	34	68.0	50	100.0	<0.001*
Limited respiratory effort (dyspnea)	17	34.0	0	0.0		16	32.0	0	0.0	
No spontaneous effort	0	0.0	0	0.0		0	0.0	0	0.0	
Oxygen saturation					<0.001*					<0.001*
>95% on room air	32	64.0	50	100.0		32	64.0	50	100.0	
95% on room air	18	36.0	0	0.0		18	36.0	0	0.0	
<95% on room air	0	0.0	0	0.0		0	0.0	0	0.0	

Patent airway										
Patent	50	100.0	50	100.0	-	50	100.0	50	100.0	-
Tracheal tugging	0	0.0	0	0.0		0	0.0	0	0.0	
See saw breathing pattern	0	0.0	0	0.0		0	0.0	0	0.0	
Cough										
None	50	100.0	50	100.0	-	50	100.0	50	100.0	-
Productive	0	0.0	0	0.0		0	0.0	0	0.0	
Non-productive	0	0.0	0	0.0		0	0.0	0	0.0	
Skin color										
Normal	50	100.0	50	100.0	-	50	100.0	50	100.0	-
Cyanosis	0	0.0	0	0.0		0	0.0	0	0.0	
Pale	0	0.0	0	0.0		0	0.0	0	0.0	
Breathing Sound	50	100.0	50	100.0	-	50	100.0	50	100.0	-
Normal	0	0.0	0	0.0		0	0.0	0	0.0	
Rales / ronchi	0	0.0	0	0.0		0	0.0	0	0.0	
Stridor/wheezes										
Respiratory Depth	33	66.0	50	100.0	<0.001*	34	68.0	50	100.0	<0.001*
Normal	17	34.0	0	0.0		16	32.0	0	0.0	
Hyperpnoea	0	0.0	0	0.0		0	0.0	0	0.0	
Hypopnoea										
Respiratory Rhythm	33	66.0	50	100.0	<0.001*	37	74.0	50	100.0	<0.001*
Regular	17	34.0	0	0.0		13	26.0	0	0.0	
Irregular	0	0.0	0	0.0		0	0.0	0	0.0	
Paradoxical										
Nijmegen score					<0.001*					<0.001*
Significant hyperventilation	0	0.0	0	0.0		0	0.0	0	0.0	
Mild hyperventilation	18	36.0	0	0.0		18	36.0	0	0.0	
Normal breathing pattern	32	64.0	50	100.0		32	64.0	50	100.0	

χ^2, p: χ^2 and p values for **Chi square test** for comparing between **Pre-operative**and **3rd day postoperative** in two groups^{MC}p: p value for **Monte Carlo** for Chi square for comparing between **Pre-operative**and **3rd day postoperative** for both groups*: Statistically significant at $p \leq 0.05$

Table(4-9): compares between the preoperative and the third day postoperative regarding breathing pattern characteristics for both groups. A recognizable improvement in breathing pattern characteristics were observed over the third day postoperatively in both groups . However, this improvement shows a significant differences between both groups in relation to respiratory depth (p=0.001) ,respiratory rhythm (p=0.001), respiration (p=0.001), Nijmegen score (p=0.001) and oxygen saturation (p=0.001) respectively.

IV. Discussion

Abdominal surgery and general anaesthesia directly affect respiratory symptoms. Upper abdominal surgery alters postoperative pulmonary function. There are also falls in oxygen saturation , pain, anxiety and development of postoperative pulmonary complications . However, abdominal surgery may lead to adoption of rapid shallow breathing pattern causes uneven ventilation of lungs. This results in hypoxemia. These impairment of respiratory muscle functions after abdominal surgery may lead to postoperative pulmonary complications (Sannjeev Khanna,2013) . Between 20% and 40%of patients having abdominal surgery develop pulmonary complications.

It is a challenge for all staff to prevent patients undergoing abdominal surgery from developing postoperative pulmonary complications (PPCs). (PPCs) may be prevented by reinflating collapsed alveoli and evacuating accumulated mucus(Terri Weaver,2013). This necessitate the use of incentive spirometry and considered it as a routine postoperative intervention. The physiological principle of incentive spirometry is to produce a sustained maximal inspiration to prevent restrictive breathing pattern after abdominal surgery. Furthermore, nurses had a significant role in teaching patients the correct use of incentive spirometry.

The current study sought to determine, the effect of incentive spirometry use on postoperative breathing pattern among abdominal surgical patients. Abdominal surgical patients who use incentive spirometry show an obvious improvement in all postoperative breathing pattern characteristics and vital signs. Abdominal surgical patients who use incentive spirometry show an obvious improvement in all postoperative breathing pattern characteristics and vital signs. This result shows a significant differences between study and control

groups at the first two days postoperatively .But, this difference was not statistically significance between the two groups at the third day postoperatively. Although, the breathing pattern characteristics and vital signs were improved from the first two days in the study group. While , in control group the postoperative breathing characteristics and vital signs were significantly changed. Meanwhile, many studies conducted to confirm the effect of using incentive spirometry following abdominal surgery.

The results of the current study shows that, there were no statistically differences between study and control groups in relation to preoperative breathing pattern characteristics and vital signs. As patients scheduled for elective abdominal surgery and the study group not receiving the training program about the correct use of incentive spirometry. This result supported by an experimental study by Othman.W.N et al (2017) they found that no statistically differences between the study and control groups before applying deep breathing exercise with incentive spirometry regarding all parameters of pulmonary function.

The current study shows , a significance differences between morning and evening shifts within study group in relation to all breathing pattern characteristics and vital signs from the first two days postoperatively . However, breathing pattern characteristics and vital were better preserved at evening shift. As at morning shift the patient will be exposed to many other medical and nursing procedures. Thus interrupt the cycles that should be completed as the patient needs more attention during morning shift as the secretion accumulation were established while the patient sleep at night. As, the administration of incentive spirometry necessitate a physiological and psychological stability of the patients. This result come in reference with a study of Sanjeev Khanna (2013) ,who conducted an experimental study in sixty abdominal patients. Patients were randomized into study group(n=30) and control group(n=30). Patients in study group were given three supervised sessions of incentive spirometry whereas control group were taught deep breathing exercises preoperatively. There is a significant differences in pulmonary functions values in three and five days after surgery in both groups. However, incentive spirometer group shows better improvement .He conclude that, this study shows the efficacy of incentive spirometry in improving pulmonary functions after abdominal surgery.

The study findings demonstrate that, no significance differences between the two groups when compare the preoperative data with the third day postoperatively. However, breathing pattern characteristics and vital signs were better preserved in study group. As deep breathing with incentive spirometry enhances recovery and prevent complications in study group. This finding supported by a study by Shashi & Rakesh (2017) who conducted a pilot study with quasi-experimental research design to assess the effectiveness of deep breathing exercise with incentive spirometry among patients with abdominal surgery and to reduce postoperative pulmonary complications.

They found that ,deep breathing with incentive spirometer improves respiratory functions and prevent from postoperative pulmonary complications. Respiration rate among experimental group had a significant reduction, whereas in control group there was no significance difference. Patients in experimental group maintained oxygen saturation and did not show any significance difference, while in control group there was a significant reduction in oxygen saturation rate. Practicing deep breathing exercise increases the lungs capacity, which have seen in the results.

The volume of incentive spirometry was high in experimental group in post-operative phase then the patients without deep breathing exercise with incentive spirometer , in both the group the volume of incentive spirometer had shown a significant difference from pre-operative to post-operative phase. Study also reported of better lung capacity postoperatively in patient with spirometry exercises. All the patients were assessed for post-operative complications specifically presence of cough, lung sound, hyperthermia and difficulty in breathing. There were no complication developed among experimental group. Whereas, control group patients developed cough, lung sound was not clear, body temperature was more than normal and difficulty in breathing (dyspnea).

V. Conclusion& Recommendations

The current study aimed to assess the effect of incentive spirometry on postoperative breathing pattern among abdominal surgical patients. Based on the results of this study ,it can be concluded that incentive spirometry can lead to significant changes on postoperative breathing pattern characteristics among abdominal surgical patients. The improvement of these characteristics as follows:

- Regarding postoperative vital signs, there were a significant improvement in the vital signs following incentive spirometry use in study group and shows a significant differences between both groups from the first two days postoperatively.
- There were a noticeable improvement in postoperative breathing pattern characteristics in study group . This improvement shows a significant differences between both groups in the first two days postoperatively.

- Regarding the comparison between the morning and evening shifts ,there were a significance differences in relation to all breathing pattern characteristics and vital signs from the first two days postoperatively with an obvious improvement in breathing pattern characteristics and vital signs at evening shift.
- Regarding the comparison between the preoperative data of both groups ,there were no significant differences between both groups.
- In relation to the comparison of preoperative data and the third day postoperatively , there were a significance differences between the two groups in relation to breathing pattern characteristics except in breathing sounds, cough and airway patency and vital signs with a recognizable improvement of postoperative breathing pattern characteristics and vital signs in the third day postoperatively for both groups . However, breathing pattern characteristics and vital signs were better persevered in study group from the first two days.

6.2 Recommendations

In the reference of the results of the current study ,the following recommendations are suggested:

6.2.1:Nursing recommendations for practice:

- Improving abdominal surgical patients outcomes by integrating evidence based nursing into nursing practice.
- Enhancing the correct use of incentive spirometer for abdominal surgical patients by the assigned nurse.
- Recognizing the subsequent risk factors for developing altered postoperative breathing pattern among abdominal surgical patients.

6.2.2 Nursing recommendations for education:

- Educating surgical nursing staff about the correct use of incentive spirometer.
- Providing a chance for the surgical nursing staff to demonstrate competency in the correct use of incentive spirometer.
- Orientation program about incentive spirometer ,its purpose and the correct use were needed to provide an opportunity for the nursing staff to get familiar with the incentive spirometer and work with it at the time being at the surgical department.
-

6.2.2 Nursing recommendations for administration and organizational policy:

- Enhancing the importance of appropriate incentive spirometer practices documentation.
- Establishing a policy about routine use of incentive spirometer for abdominal surgical patients.
- **6.4 Suggestions for further study :**
- Designing a randomized control trial about the effect of using incentive spirometer on postoperative breathing pattern among abdominal surgical patients.
- Abdominal surgical patient's compliance in using incentive spirometer.
- Expanding the current study to involve more variables to replicate the study in various geographical areas by using a variety of sample.

List of References

[1]. Aqilah Leela Narayanan, Syed Rasul G Syed Hamid Eko Supriyanto. (2015). Evidence regarding patient complaince with incentive spirometry interventions after cardiac, thoracic and abdominal. *Cardiology*. 52 (1), 18-26.

[2]. Christie, Armstrong, C. O. (2017). Post-op incentive spirometry. *Nursing*, *47*(6), 54–57. http://doi.org/10.1097/01.NURSE.0000516223.16649.02

[3]. Colucci, M.,Chiavegato, L. D., &Faresin, S. M. (2015). Cough Impairment and Risk of Postoperative Pulmonary Complications after Open Upper Abdominal Surgery. *Respiratory Care*, *60*(5), 673–678. http://doi.org/10.4187/respcare.03600

[4]. Dias, C. M., Plácido, T. R., Ferreira, M. F. B., Guimarães, F. S., &Menezes, S. L. S. (2008). Incentive spirometry and breath stacking: Effects on the inspiratory capacity of individuals submitted to abdominal surgery. *RevistaBrasileira de Fisioterapia*, *12*(2), 94–99. http://doi.org/http://dx.doi.org/10.1590/S1413-35552008000200004

[5]. Erick peper, Christopher D. Gillbert, Richard Harvey I-Mei Lin. (2015). A learned Disuse Risk Factor for Breathing Dysfunction. *Applied psychology*. 43 (4), 173-179.

[6]. JaumeCanet, LluísGallart, Carmen Gomar, GuillemPaluzie, JordiVallès, Jordi Castillo, ; SergiSabaté,.ValentínMazo,. ZaharaBriones, JoaquínSanchis, (2010). Prediction of Postoperative Pulmonary Complications in a Population-based Surgical Cohort. *Anesthesiology*. 113 (12), 1338-1350.

[7]. Jakobson, T., Karjagin, J., Vipp, L., Padar, M., Parik, A. H., Starkopf, L., Starkopf, J. (2014). Postoperative complications and mortality after major gastrointestinal surgery. *Medicina (Kaunas, Lithuania)*, *50*(2), 111–117. http://doi.org/10.1016/j.medici.2014.06.002

[8]. Kanakala, V., Borowski, D. W., Pellen, M. G. C., Dronamraju, S. S., Woodcock, S. A. A., Seymour, K., … Horgan, L. F. (2011). Risk factors in laparoscopic cholecystectomy: A multivariate analysis. *International Journal of Surgery*, *9*(4), 318–323. http://doi.org/10.1016/j.ijsu.2011.02.003

[9]. Istomina, N. (2011). *Quality of Abdominal Surgical Nursing Care*.

[10]. Mark A Yoder,SatSharma,FranciscoTalavera,William A Schwer ,Helen M Hollingsworth. (2015). perioperative pulmonary management. *Pulmonary and critical care medicin*. 2 (3), 3,4,5,9.
[11]. Mohamady, H., Waked, I., & Attalla, A. (2016). Preoperative respiratory physical therapy program as a prehabilitation to improve inspiratory muscle function and quality of life in patients undergoing upper abdominal surgeries: a prospective randomized controlled trial. *Bulletin of Faculty of Physical Therapy*, *21*(1), 17. http://doi.org/10.4103/1110-6611.188030
[12]. Rupp, M., Miley, H., & Russell-Babin, K. (2013). Incentive Spirometry in Postoperative Abdominal/Thoracic Surgery Patients. *AACN Advanced Critical Care*, *24*(3), 255–263. http://doi.org/10.1097/NCI.0b013e31828c8878
[13]. Van Dixhoorn J,Folgering.H.(2015).The Nigimen Questionnaire and Dysfunctional Breathing .ERJ Open Research, 1(1),00001-2015 http://doi.org/10.11837/2312054. 00001-2015

Mrs .Walaa Jamaan Al-Harbi. "The Effect of Using Incentive Spirometry on Postoperative Breathing Pattern Among Abdominal Surgical Patients." IOSR Journal of Nursing and Health Science (IOSR-JNHS), vol. 07, no. 1, 2018, pp. 20-34.