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Effect of Pulmonary Care Measures on Reducing Respiratory Tract Infection and Dispend Grades among Postoperative Elderly Patients with Abdominal Surgeries

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Background: *Postoperative respiratory tract infection (RTIs) are more common among elderly patients with laparotomy and present a significant burden to health care systems by increasing health care costs, resource utilization, hospital length of stay, morbidity, and mortality.* ***Aim of the study****: To evaluate the effect of pulmonary care measures on reducing RTIs and dyspnea grades among postoperative elderly patients with abdominal surgeries.* ***Research design:*** *Quasi-experimental research design was utilized in the current study.* ***Subjects:*** *Convenient sample including 80 elderly patients male and female, they were classified equally into two equal groups, study group (n= 40), and control group (n= 40) , were collected through one year.* ***Setting****: This study was carried out at the general surgery departments (A and C) at Minia University Hospital.* ***Tools of data collection:*** *three tools were utilized in collecting data;* ***tool I:*** *Patient interview structured questionnaire;* ***tool II:*** *Patient's physical and respiratory assessment;* ***tool III:*** *Medical research council dyspnea scale to collect data.* ***Results:*** *current study findings revealed that 87.5 % of the study group was free from postoperative RTIs. In contrast to, 85% of the control group had postoperative RTIs.* ***Conclusion:*** *The study findings concluded that, combined pulmonary care measures of percussion & vibration, deep breathing &coughing exercises, and incentive spirometery had a positive effect on reducing postoperative RTIs& dyspnea grades, improving respiratory parameters and decreased length of hospital stay among elderly with laparotomy.* ***Recommendations:*** *Hospitals should recommend implementing protocols and guidelines based on evidence nursing practice for pre and postoperative care as a routine hospital policy for all surgical patients in all age groups.*

Key Words*: Aging process, postoperative respiratory infections, nursing strategies, peri-operative care, , incentive spirometery, chest physiotherapy, risk factors.*

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I. Introduction

Surgical procedures are now more common in the elderly because of longer life expectancies and enhanced surgical safety. Fifty percent of individuals older than 65 years undergo surgical procedures during their remaining years. Abdominal surgery is one of the most common operative procedures performed among the elderly surgical patients including both emergency and elective surgical interventions and constituted 36 % **(Chen et al., 2011).**

Age-related physiological changes which include decrease in cognition, cardiac, respiratory, renal functions and other co-morbidities, as well, dependence on activities of daily living and frailty are interrelated and overlapping. These interplaying factors work to demand multifaceted care in an elderly surgical patient. **(Tan &Chua, 2013)**

The primary concerns of the postoperative nursing care and monitoring for the hospitalized elderly patients in the general surgical units at the initial hours postoperative involves; adequate ventilation, hemodynamic stability, incisional pain control , preventing nausea and vomiting, assessing the neurological status, surgical site integrity, dressing, ensuring tubes and lines are well secured, and amount of drainage, and spontaneous voiding, as well as, capillary refill time, percentage of oxygen administration, oxygen saturation using pulse oximetery, intake and output, bowel sounds, performing respiratory exercises.**(Griffiths,2014)**

Postoperative respiratory tract infection (RTIs) are more common in elderly surgical patients with abdominal surgery due to lack of lung inflation that occurs due to change of breathing pattern, prolonged recumbent positioning, also, adds to impairment of mucociliary clearance with decrease cough effectiveness and increase risk associated with retained pulmonary secretions. In addition to, anaesthesia, opioids, analgesics and post-operative pain, they also contribute to change in ventilation pattern. **(Masse, 2017)**

To decrease the incidence of these complications, studies highlighted that, performance of pulmonary care measures which include percussion & vibration, deep breathing & coughing exercises, and using incentive spirometery to postoperative elderly patients with abdominal surgery gives positive results, both in physical and psychological status and help elderly patients to return to their activities of daily living (ADLs) within a shorter period of time.**(Duarte & Machado,2016)**

The previous pulmonary care measures are simple, inexpensive pulmonary care modalities that could be easily understood and remembered by elderly patients, their families, and nursing staff, and free from side effects, which make them more effective in management of respiratory problems, and consequently improving elderly functional status and quality of life **(Yang, 2016).** Recent study revealed that, preoperative education and breathing exercise training alone is reported to be associated with a 75% relative risk reduction and absolute risk reduction of 20% in postoperative RTIs **Boden, (2018).**

Significance of the study:

Findings of all previous studies indicated that, postoperative RTIs significantly increased consumption of healthcare resources and rate of admissions to intensive care units, increased hospital length of stay (LOS) and hospital readmission rate within the first 30 postoperative days. As well, it was considered the main source of postoperative morbidity and mortality. Treatment costs for postoperative RTIs are 50% greater than costs for treating postoperative cardiac complications **(Boden, 2018)**. Several studies reported that, postoperative RTIs are common among elderly surgical patients with abdominal operations and accounted 17- 88% **(Do Nascimento Junior, 2014).**

Aim of the study:

The aim of the present study was to evaluate the effect of pulmonary care measures on reducing the RTIs and dyspnea grades among postoperative elderly patients with abdominal surgeries. Research hypothes

- Using the pulmonary care measures would reduce the respiratory tract infection and dyspnea grades occurrence among postoperative elderly patients with abdominal surgeries.

II. Subjects and Methods

Research design

Quasi-experimental research design was utilized in the current study.

Sample and sampling:

- Convenient sample of 80 elderly patients male and female were collected through one year, and they were classified equally into two groups; study group (n =40) who performed pulmonary care measures and control group (n =40).

Exclusion criteria:-

- Patient's with neuropsychiatry diseases.
- Patient with preoperative respiratory tract infections, COPD and asthma.
- Patient with emergency abdominal surgeries.
- Patients with uncontrolled postoperative complications.
- Patients with uncontrolled chronic disease.
- Immobilized patient.

Setting:-

The current study was carried out at the general surgery departments (A and C) at Minia University Hospital.

Tools of data collection: - **three tools were used:**

Tool I: Patient interview structured questionnaire. It covered two main parts:

- **Part I; The bio-socio-demographic data** of the patients which included (age, gender, level of education, and………..etc.

Part II; The medical and surgical patient's assessment data included:

- **Past and present medical data such as**; history of smoking, recurrent chest infections, and date of admission, diabetes, hypertension, and ect,....
- **The current surgical data such as;** surgical diagnosis, absence or presence of NGT, postoperative analgesia, ect,….

Tool II: Patient's physical and respiratory assessment that included **:**

- o Measuring vital signs as temperature, pulse, respiration.
- o Respiratory assessment such as chest sounds, oxygen saturation, RTIs manifestations as cough, sneezing, runny nose, sore throat, and etc….

Tool III: Modified Medical Research Council dyspnea scale (MMRC):-

This scale used to evaluate the severity of dyspnea among the postoperative elderly patients with abdominal surgeries. Adopted fromFletcher, et al., (2006) . The scoring system of this scale divided by the author as following:-

Grade	Description of Breathlessness
Grade 0	I only get breathless with strenuous exercise
Grade 1	I get short of breath when hurrying on level ground or walking up a slight hill
Grade 2	On level ground, I walk slower than people of the same age because of breathlessness, or I have to stop for breath when walking at my own pace on the level
Grade 3	I stop for breath after walking about 100 yards or after a few minutes on level ground
Grade 4	I am too breathless to leave the house or I am breathless when dressing

Tools validity:-

Content validity was done to identify the degree to which the used tools measure what was supposed to be measured. The developed tools were examined by a panel of three experts opinion in the field of the study {Minia University - faculty of nursing (Medical Surgical Nursing Department)} All jury members (100%) agreed that current study tools were valid and relevant with the aim of the study.

Tools reliability:-

Intraclass correlation coefficients at baseline and follow up was performed for reliability testing internal consistency for the modified Medical Research Council dyspnea scale were 0.84 - 0.90.

Pilot study:-

A pilot study was carried out on 10% (n = 8) of the total sample to test the clarity of tools and estimate the time required for fulfilling it. Based on results of the pilot study no modifications or refinements were done and the subjects included to the actual sample.

Ethical Considerations:-

An official permission to conduct the study was obtained from the Ethical committee in the Faculty of Nursing, Dean of nursing faculty and the Manager of Minia University Hospital, the Head of the General Surgery Departments (A and C) and agreement from Egypt academic for research center and technology. to carry out this study. Subject's participation in this study was voluntary and each involved subject was informed about the purpose, procedure, benefits, and nature of the study, and that he/she had the right to withdraw from the study at any time without any rationale, then oral consents were obtained. Confidentiality and anonymity of each subject were ensured through coding of all data and protecting the obtained data. Subjects were informed that obtained data will not be included at any further researches without a second oral consent.

Educational training practices about the postoperative pulmonary care measures formulated by the researchers after revising extensive relevant literature review such as **(Lynn, 2015) & (Alexandra, 2014)**, and other information from web sites. They were applied to reduce the postoperative RTIs and dyspnea grades among elderly patients with abdominal surgeries. They included Arabic photo brochure of the following measures:-

- o The 1st measure: **Percussion and vibration** performed for 15 minutes by the researchers then repeated daily every 4 hours through the morning& afternoon shifts.

- The 2nd measure: **Deep breathing & coughing exercises** performed 15 times by the participants then repeated daily every 4 hours through the morning& afternoon shifts.
- The 3rd measure:**Using three ball incentive plastimed spirometery** applied 15 times by the participants then repeated daily every 4 hours through the morning& afternoon shifts.

All the above measures performed by the participants in the study group from the 1st to the 5th postoperative day.

Postoperative pulmonary care measures:-

1.Manual airway clearance technique:-

a. Percussion:

Percussing lung areas involves the use of cupped palm to loosen pulmonary secretions expectorated with ease.Percussing with the hand held in a rigid dome-shaped position, the area over the lung lobes to be drained in struck in rhythmic pattern.Usually the patient will be positioned in supine or prone and should not experience any pain. Cupping is never done on bare skin or performed over surgical incisions, below the ribs, or over the spine or breasts because of the danger of tissue damage.Typically, each area is percussed for 30 to 60 seconds several times a day.If the patient has tenacious secretions, the area must be percussed for 3-5 minutes several times per day. Patients may learn how to percuss the anterior chest as well.
(http://currentnursing.com/reviews/chest_physiotherapy.html)

b. Vibration:-

Immediately follows percussion for each area and position. the hands may be placed side by side or on top of each other, the patient is instructed to take in a deep breath while in a proper position. A gentle but steady contraction of the upper extremities is performed to vibrate the chest wall, beginning at the peak of inspiration and following the movement of chest deflation.

(http://currentnursing.com/reviews/chest_physiotherapy.html)

Figure (1) : Showing percussion technique.
http://downloads.lww.com/wolterskluwer_vitalstream_com/sample-content/9780781788786_Craven/samples/mod09/topic10a/text.html

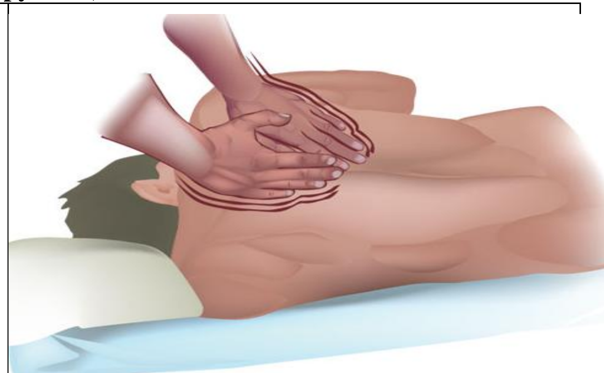

Figure (2) :Showing vibration technique.
http://physiorehab.in/cs-pulmonary-rehabilitation/

2. Deep breathing exercise:-

Sit in a comfortable position – ideally high up in bed with your head and shoulders well supported by pillows or sitting over the edge of the bed or sitting out in a chair · Hold a pillow firmly against your incision. Take a long, slow, deep breath in to fully expand the lungs. Hold for 3seconds, then breathe out slowly. Repeat this 4 to 5 times. Then take a rest, breathing at a relaxed level in approximately 10 sec. Continue this "cycle" three times.**(Westerdahl, 2015)**

Deep breathing exercise (Westerdahl, 2015)

3. Using incentive spirometery:

The patient is instructed to hold the spirometer in an upright position, exhale normally, and then place the lips tightly around the mouthpiece. The next step is a slow inhalation to raise the ball (flow-oriented) or the piston/plate (volume-oriented) in the chamber to the set target. At maximum inhalation, the mouthpiece is removed, followed by a breath-hold and normal exhalation. **(Eltorai, et al., 2018) https://accesshealth.com.au/triflow-incentive-breathing-spirometer**

Procedure:-

The current study was conducted by preparing of different data collection tools, in addition to, obtaining formal paper agreement which was taken in duration one week before conducting the current study. The researchers act their collection of the current study data from its setting on daily basis (along the 1st five days postoperative) during morning or afternoon shifts over a period of one year starting from mid July 2016 to mid-July 2017.

The researchers started data collection from the control group firstly at the first six months of the study duration by using the three tools; Tool I: patient interview structured questionnaire &; Tool II: physical and respiratory assessment sheet, Tool III: dyspnea scale, then data collection from the study group started at the second six months of the study duration by using the same three tools before and after they applying the pulmonary care measures.

Preoperative training about the pulmonary care measures over a period of two or three days was done by the researchers to each participant in the study group individually through face to face interview to follow the prescribed instructions. The number of total sessions during training them average from 2-3 sessions varied according to each participant understanding, and every session lasted 30-45 minutes. The demonstration and re-demonstration was done by the study group to ensure that the participant can perform this procedures perfectly and the researchers evaluated it by using the checklist procedures.

Each participant was informed by the researchers to perform and repeat the pulmonary care measures daily from the 1st to 5th day postoperative. After that, the researchers performed respiratory assessment daily after the participant practiced these strategies by using the second and third tools (physical and respiratory assessment sheet, and dyspnea scale).

On the other hand; the researchers trained the internship nursing students as co-researchers who had shift in the same study setting to follow up the study group who was applied the pulmonary care measures in accurate time during specific work shift to ensure that the elderly patients perform the procedures when the researchers not found, as elderly surgical patients were considered critically ill and easy forget, so, they need close observation to perform the procedures.

Statistical analysis of data:

Data were summarized, tabulated, and presented using descriptive statistics in the form of means and standard deviations as a measure of dispersion. A statistical package for the social science (SPSS), version (20) was used for statistical analysis of the data, as it contains the test of significance given in standard statistical books. Qualitative data were expressed as percentage. Correlation coefficient was done by using Pearson correlation test. Fisher's Exact test is a way to test the association between two categorical variables. when in case of small cell sizes (expected values less than 5). Chi-square test is used when the cell sizes are expected to be large.

III. Results

Table (1): Distribution of the study and control groups regarding their Socio demographic characteristics (n = 80)

Socio demographic data	Groups				χ^2	*P*-value
	Study (n=40)		Control (n=40)			
	No.	%	No.	%		
Age / years						
60-63	22	55	23	57.5	.817	.930 NS
64- 67	18	45	17	42.5		
Mean ± SD	63.9 ± 2.1 years		62.8 ± 2.0 years			
Gender						
Male	18	45	26	65	.201	.654 NS
Female	22	55	14	35		
Educational level						
Illiterate	19	47.5	17	42.5	.244	.885 NS
Read and write	14	35	16	40		
Basic	7	17.5	7	17.5		
Occupational status					1.145	.925 NS
Worker	8	20	12	30		
Retired	10	25	8	20		
House wife	22	55	20	35		

NS= not significant

Table (1): Showed that, the mean age among study and control groups was nearly similar (63.9 ± 2.1 years, and 62.8 ± 2.0 years) respectively. In respect to gender; The results revealed that 55% of the study group were female while 65 % of the control group were male. Concerning to educational level; the study data demonstrated that, 47.5 % of the study group were illiterate. While, 17.5% of them were basic education. Lastly ; the findings displayed that, 55%, 35 % respectively among the study and control groups were house wives. There were no statistical significant differences between both groups in relation to socio demographic characteristic.

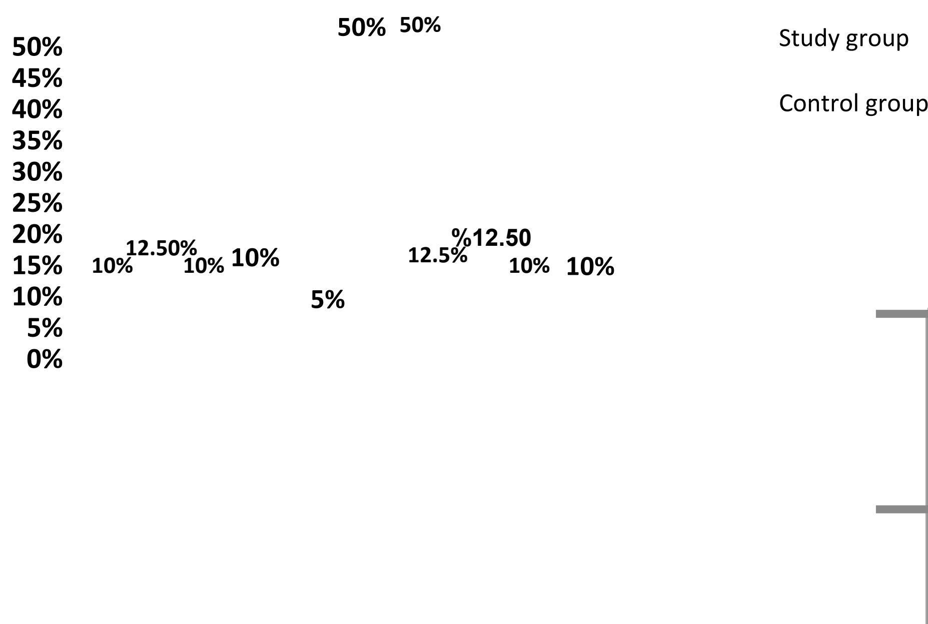

Figure (1): Distribution of the type of surgery among the study and control groups (n= 80).

Figure (1): illustrated that, 50% of both groups were performed cholecystectomy.

Table (2):-*Comparison between the study and control groups regarding to auscultatory breathing sound in the 1st five days postoperative (n= 80)*.

Groups						
Auscultatory reading from 1st to 5th day *postoperative*	**Study**		**Control**		**X²**	***P-value***
	No.	%	No.	%		
Breathing sound						
1st day						
Clear	40	100	40	100	**Fisher**	………
2nd day						
Clear	40	100	40	100	**Fisher exact**	…….
3rd day						
Clear	37	92.5	10	25.0	37.602	.000**
Crackles	3	7.5	30	75.0		
4th day						
Clear	35	87.5	6	15	31.745	.000**
Crackles	5	12.5	34	85		
5th day						
Clear	35	87.5	6	15	32.125	.000**
Crackles	5	12.5	34	85		

** highly statistical significance differences

Table (2):- Represented that, 100 %,100 %, 92.5 %, 87.5 %, 87.5 % respectively of the study group had clear chest sound along the 1st five days postoperatively, in comparing with, 100% of control group had clear chest sound only at the 1st and 2nd days postoperatively and in the rest of days was had crackles. There were high statistical significant differences between the both groups regarding to breathing sound in which p-value = .000**

Table(4):- Comparison between the study and control groups regarding to RTIs manifestations through the 1st five days postoperative (n= 80).

Groups						
RTIs manifestations	Study (n=40)		Control (n=40)		**X²**	***P-value***
	No.	%	No.	%		
Abnormal respiratory manifestations						

Yes	5	12.5	34	85.0	42.076	.000**
No	35	87.5	6	15.0		
Neuromuscular and sleeping manifestations						
Yes	2	5	24	60	29.463	.000**
No	38	95	16	40		
GIT manifestations						
Yes	2	5	27	62.5	4.922	.027*
No	38	95	15	37.5		
Eye and ear manifestations						
Yes	3	7.5	27	62.5	5.333	.021*
No	37	92.5	15	37.5		
Chest x-ray findings						
Positive	5	12.5	34	85.0	42.076	.000**
Negative	35	87.5	6	15.0		

* statistically significance differences ** highly statistical significance differences
RTIs = Respiratory tract infections.

Table (4):- Showed that, 12.5% of the study group had abnormal respiratory manifestations & positive chest x-ray findings, in contrast to, 85.0% of the control group had abnormal respiratory manifestations & positive chest x-ray findings with other manifestations constituted 60%, 62.5%, & 62.5% respectively. There were high statistical significant differences among both groups regarding the manifestations of RTIs, in which P-value = .000**, .027*, .021*

Table (5):- Correlation between the manifestations of RTIs, and dyspnea grades& peripheral oxygen saturation measurements along the 1st five days postoperative (n= 80).

RTIs manifestations	***Dyspnea grades***				***Peripheral oxygen saturation measurements (SpO_2)***			
	Study group		***Control group***		***Study group***		***Control group***	
	r	***P*-value**	r	***P*-value**	***r***	***P*-value**	***r***	***P* - value**
Respiratory manifestations	.683	.034*	.975	. 023*	.645	.000**	.580	.012*
Neuromuscular	.809	.021*	.565	.056*	.542	.004**	.695	.018*
GIT manifestations	.739	.026*	.722	.043*	.937	.000**	.585	.014*
Eye and ear manifestations	.679	.043*	.589	.051*	.883	.015*	.472	.242
Chest x- ray findings	.720	.052*	.865	.032*	.742	.000**	.710	.021*

* statistically significance differences ** highly statistical significance differences
RTIs = Respiratory tract infections

Table (4):-Revealed that, there was statistical significant strong positive correlation among the study group between absence of all RTIs manifestations items and less dyspnea grades & normal peripheral oxygen saturation measurements.

IV. Discussion

Result of current study demonstrated that, the mean age among the study and control groups was nearly similar (63.9 ± 2.1 years & 62.8 ± 2.0 years) respectively; this due to the major advances in healthcare systems that have enabled people to live longer and to remain healthy for a significantly greater amount of time. Today, major surgical operations are offered to many numbers of geriatric patients and the frequency of digestive operations performed in elderly patients, and even in subgroups of them has increased.

Findings of the present study were compatible with , **Watt, et al., (2018), (Qureshi, 2018) & Chen et al., (2011)** who documented that, elderly patients are becoming an increasingly large population of most surgical practices, consistent with demographic shifts and over half of surgical procedures requiring hospital stays were performed in patients aged 65 or older, and they have major abdominal surgeries accounted more than 36% of the general surgical procedures. Also, further validation by, **Chavan,(2014),** who found that, the highest numbers 76 (59.38%) of elderly patients undergone abdominal operations were in the age group of 60 to 65 years and the mean age of the studied patients is 67 years (range is 60-80 years).

Findings of the present study showed that, around and more than half of the total sample was male, according to **Qureshi, (2018),** who stated that, the percentage of males was higher in all the age groups than females regarding to abdominal surgery. These results validated by **Jing, (2018),** who investigated the incidence and risk factors of postoperative pulmonary infection. He displayed that, male elderly patients constituted (61.8%) of the total study participants , while female elderly patients constituted (38.2%).On the other hand, these findings were contradicted with, **Ávila & Fenili, (2017), and Tadyanemhandu et al., (2017),** who concluded that, gender was not association with postoperative RTIs.

Concerning to educational level; the current study findings demonstrated that, the highest percentage of both groups were illiterate, as in the past, there no interest in teaching so, illiteracy are common among elderly. According to, **Central Agency for Public Mobilization and Statistics (CAPMAS) in Egypt (2013), reported that,** illiteracy rate among the Egyptian elderly, ranging from 60 years or more, is 64.9 %. Among their highest rates in Upper Egypt cities, according to the report, is Fayoum with 37 %, followed by Sohag and Minia. similarly, **De Almeida, (2017),** determined that, more than half (54%) of both groups in his study were illiterate & primary school graduates.

The present study findings showed that, half of both groups were had cholecystitis. This may be rationalized by incidence of cholecystitis and gallstones increases with age and among female due to decreased gallbladder motility and cholesterol metabolism in older people. These results corresponded by **Bhandari, (2017)**, who reported that, cholecystitis and gallstones increase with old age by 13–50%. As well as, **Ukkonen , (2017)**, who evaluated the outcomes of emergency gastrointestinal surgical and endoscopic procedures among elderly patients; he mentioned that, cholecystitis was one of the most common indications for abdominal surgeries among elderly surgical patients and represented 32%, followed by incarcerated hernia 14% and malignancies 12%.

On other hand, Results of the current study disagreed with **Racz, (2012),** who investigated the elective and emergency abdominal surgery among patients 90 years of age or older; he reported that, the most common diagnoses in his study were colorectal cancer and hernias; each comprising 19.3%, and the most common procedures were bowel resection with anastomosis (25.5%) and hernia repair (18.6%).

The current study data represented that, the vast majority of the study group had clear chest sound, while the vast majority of the control group had crackles due to applying chest physiotherapy along with incentive spirometry results in improved clearance of bronchial secretion from lung periphery to more proximal branch thus aids expectoration which enhancing pulmonary hygiene and preventing accumulation of secretions.

Similarly**, Abd Elgaphar, & Soliman, (2015),** who analyzed the effect of early post-anesthetic chest physiotherapy on elderly patients undergoing upper abdominal surgery. The investigator summarized that, (73.3, 100 %) respectively of the study group had clear chest sound at the second and third assessment, compared with (56.8 % 83.1%) respectively of the control group had crepitation and crackles. While, these results were contradicted with**, Kale, (2017),** who investigated the effectiveness of pre‑operative deep breathing exercise on post‑operative patients of abdominal surgery; he revealed that, 100% of the experimental group had clear lung sounds by the 7th postoperative day, whereas in the control group, 76.66% had clear lung sounds at the same days.

The current study findings showed that, , the minority of the study group were had abnormal respiratory manifestations in contrast to, the majority of the control group had abnormal respiratory manifestations with other manifestations, the possible explanation for this was; the supervision and close monitoring of patients in the study group to ensure proper performance and adherence to the nursing care strategies significantly minimize the occurrence of postoperative RTIs.

The present study findings supported by **Abdelaal., (2017),** who evaluated the effectiveness of preoperative physical and respiratory therapy on postoperative pulmonary functions and complications after laparoscopic upper abdominal surgery. He established that, by the 5th postoperative day after completion of intervention, only 7 patients (27%) in the treatment group had postoperative pulmonary infections, compared with 15/24 (62.5%) patients in the control group had postoperative pulmonary infections and P = .034. Moreover, **Parry, et al., (2014),** who investigated the clinical application of the Melbourne risk prediction tool in a high-risk upper abdominal surgical population. He highlighted that, only 17% of the elderly patient in the study group had postoperative chest infections compared to, 67% of the control group had postoperative chest infections confirmed by positive x-ray findings.

The present study findings revealed that, there was statistical significant strong positive correlation among the study group between absence of all RTIs manifestations items and less dyspnea grades & normal peripheral

oxygen saturation measurements. This may be rationalized by bundle of patient and family education, chest physiotherapy and IS, were easy, inexpensive, and effective measures in mobilizing secretions, airway clearance and reducing postoperative RTIs.

These results supported by, **Tyson,et al., (2014),** established that, combining deep breathing & coughing exercises and IS were efficacious in reducing the effects of anaesthesia or hypoventilation, mobilizing secretions and re-expanding areas of collapsed lung postoperatively and improving gas exchange, and oxygenation consequently, maintenance of normal functional residual capacity was expected to prevent postoperative RTI. Also, addition of visual feedback through using IS was thought to improve breathing technique and increase patient motivation. In addition to, **Yağlıoğlu, (2015),** represented that, the mean of oxygen saturation of arterial blood improved from 92.3% ± 2.8% to 99.3% ± 1.2% after practicing pulmonary hygiene techniques and using incentive spirometery.

V. Conclusion& Recommendations

Based on current study findings, pulmonary care measures of percussion & vibration, deep breathing & coughing exercises, and incentive spirometery had a synergetic positive effect on reducing postoperative RTIs & dyspnea grades, improving respiratory parameters, oxygenation, lung ventilation, as well as decreasing respiratory work and decreased length of hospital stay among elderly with laparotomy.

- Regular training and educational programs about the pulmonary care measures (especially for elderly) should be developed to the health team members especially the nursing staff because they are the ones implementing them
- Creating respiratory assessment sheet for every patient with or without RTIs during hospitalization is important in preventing and reducing severity of postoperative RTIs.
- Comparing between different methods that used for caring of respiratory system postoperatively to determine the effectively method among elderly group.

Acknowledgment

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