Conference Paper

The effect of Pursed Lips Breathing Exercises on the Oxygen Saturation Levels of Patients with Chronic Obstructive Pulmonary Disease in Persahabatan Hospital, Jakarta

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Abstract

Patients with chronic obstructive pulmonary disease can face increased resistance of airflow, air trapping, and lung hyperinflation. This condition can also cause decreased lung ventilation functions. Using a pursed lips breathing exercise can strengthen respiratory muscles that can improve oxygen saturation by maintaining airflow to bronchus and its branches and alveolus which then can prevent collapse in bronchiolus. The purpose of the study was to identify the effect of pursed lips breathing exercises on the oxygen saturation levels in patients with chronic obstructive lung disease in Persahabatan hospital, Jakarta. The design was quasi experimental, with a control group pre-post test design. A random sampling technique was used in the study. The exercise was provided to the intervention group for six days. The findings showed that the lung ventilation function is significantly different between pre- and post-intervention for both groups (p=0.00). Further, the average lung ventilation function in the intervention group is significantly different from that of the control group after intervention (p=0.012). In addition, while there is a significant relationship between subject age and the increase of the lung ventilation score (p=0.001), there was no relationship between height and the increase of oxygen saturation (p=0.091) and no significant relationship between sex and the increase of oxygen saturation (p=0.346). Based on these findings, the pursed lips breathing exercise is recommended to patients with chronic obstructive lung disease in order to improve the level of oxygen saturation.

Keywords: Oxygen saturation, Pursed lips breathing exercise, Chronic Obstructive Pulmonary Disease.

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1. Introduction

Respiratory physiotherapy is part of pulmonary rehabilitation. Pulmonary rehabilitation is a multidisciplinary program in chronically induced chronic respiratory disorders to

improve physical and social appearance. Pulmonary rehabilitation contains educational programs, exercises and chest physiotherapy that aims to improve the quality of exercise, the quality of life of people with COPD and reduce the number and length of hospitalization [10] Breathing exercises are part of the lung rehabilitation program which gives some benefits to COPD patients. Expiratory limitations are treated with pursed lips breathing in some patients so that relaxation exercises and controlling breathing patterns are important in rehabilitation classes. Breathing exercise in COPD patients is a way to adapt to difficulty breathing [51].

2. Methods and Equipment

2.1. Methods

This research is quantitative research, with the design of quancumcised research with the design of the Pretest-posttest wiht Control Group, the goal is to compare the intervention results of two groups namely the control group and the intervention group which are both measured before and after the intervention [52]

The control group in this study was very important to see the difference in dependent variable changes between the intervention group and the control group. After intervention, it is expected that there will be a change or effect on other variables. The above design can be seen in the following image [72].

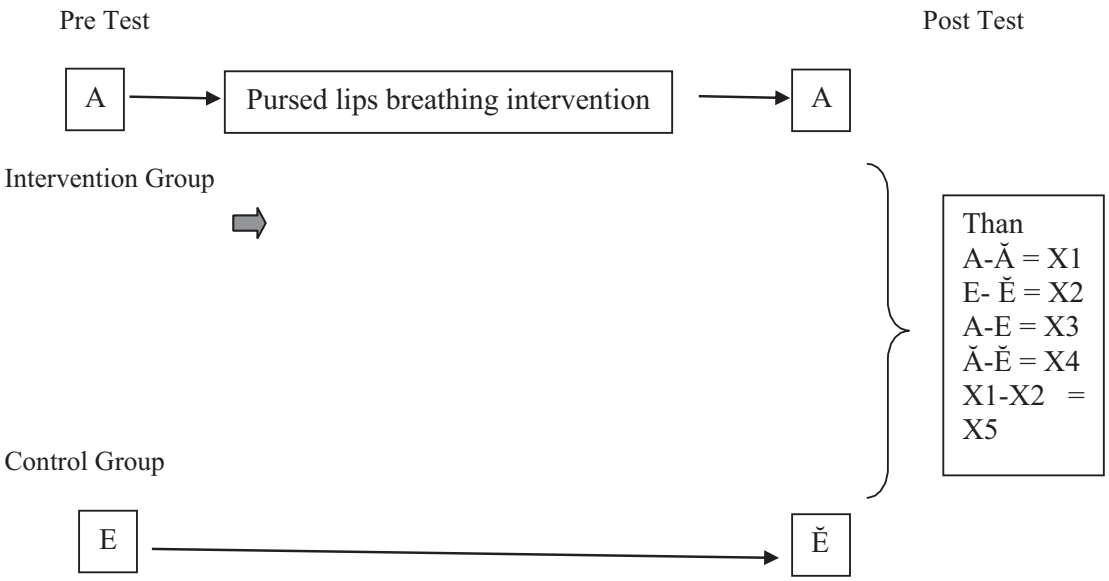

Figure 1: Form Design Research

Description:

A	=	Average oxygen saturation value before pursed lips breathing performed in the intervention group of COPD patients treated at Persahabatan Hospital Jakarta.
Ă	=	Average oxygen saturation value after pursed lips breathing performed in the intervention group of COPD patients treated at Persahabatan Hospital Jakarta
E	=	Average oxygen saturation value before intervention in the Control group of COPD patients treated at Persahabatan Hospital Jakarta
Ĕ	=	Average oxygen saturation value after intervention in the control group of COPD patients treated at Persahabatan Hospital Jakarta
X1	=	Deviation/change in the average oxygen saturation value of COPD patients treated at Persahabatan Hospital Jakarta before and after pursed lips breathing performed in the intervention group
X2	=	Deviation/change in the average oxygen saturation value of COPD patients treated at Persahabatan Hospital Jakarta before and after intervention in the control group
X3	=	Difference in the average oxygen saturation value in COPD patients treated at Persahabatan Hospital Jakarta before pursed lips breathing between the intervention group and the control group
X4	=	Changes in oxygen saturation in COPD patients treated at Jakarta Friendship Hospital after pursed lips breating between the intervention group and the control group.
X5	=	Deviation/change in the average value of oxygen saturation in COPD patients before and after pursed lips breathing in the intervention group with the average oxygen saturation value of COPD patients before and after intervention in the control group.

2.2. Population and Sample

2.2.1. Population

Populations are subjects that have certain quantities and characteristics set by researchers to study and then draw conclusions [63]. The population in this study was all COPD patients treated by Jakarta Friendship Hospital in March 2017 to May 2018 conducted for 14 months.

2.2.2. Sample

Samples are part of the number and characteristics of the population (Sugiyono, 2005), or the sample is part or representative of the population studied. In this study the sampling technique used is non probability sampling type consecutive sampling, namely the selection of samples by setting subjects that meet the criteria of research included in the study up to a certain period of time, so that the number of patients needed is met [72].

Based on the hypothesis test different two proportions were sampled as many as 24 people for the intervention group and 24 people for the control group. This sample used is based on inclusion criteria:

1. COPD patients with peak current expiration (APE) > 80%
2. Male or female patients treated at Jakarta Friendship Hospital with copd medical diagnosis, with a length of treatment of more than 6 days.
3. Patients when treated do not smoke
4. Get bronchodilator therapy
5. Does not suffer from other diseases that interfere with lung ventilation function
6. Willing to be a respondent
7. Cooperative patients

Exclusion criteria:

1. COPD patients with ventilators.
2. COPD patients are unconscious.
3. COPD patients treated less than 6 days

The details of the implementation of this study later is that if at one time there was 1 patient who met the inclusion criteria, the researcher immediately assigned him as the respondent of the study, by entering the respondent into the odd order, the next respondent was put in an even order and so on. Respondents who were in odd order were assigned a control group and respondents who were in even order were assigned as intervention groups.

The author has made a large calculation of the minimum sample based on the calculation results using a two-proportion hypothesis test with a degree of meaning

of 5%, a test strength of 95% and a 2-sided hypothesis test, obtained the following sample size [8], with the formula:

$$n = \frac{Z^2 1 - \alpha/2 \; P(1-P)}{(d)^2}$$

Description:

n	=	sample size
$Z^2 1 - \alpha/2$	=	default normal distribution value on table Z (α = 0.05) so that it is obtained $z^2$1- α /2 = 1.96
P	=	proportion with prevalence of COPD in Friendship Hospital 3.8 %
d	=	level of significance = 0.05

$$n = \frac{Z^2 1 - \alpha/2 \; P(1-P)}{(d)^2}$$

$$n = \frac{(1,96)2 \; 0,038(1-0,038)}{(0,05)2} = 24$$

To avoid dropping out in respondents, 10% of the sample amount is added

n = 24 + 10 % = 24 + 2.4 = 26.4 rounded = 27

So based on calculations using the above formula, the sample needed in this study was 54 respondents. The sample division was 27 respondents as an intervention group and 27 respondents as a control group.

Based on the results of the respondents intervention group of 24 and the control group of 24 people. Where from each group there are 3 people who drop out. this is because 3 respondents in the intervention group were not included due to unwillingness, forced return and the patient's condition deteriorated.

How to take samples in this study by determining the first patient who entered the treatment will be made into a control group and the second becomes an intervention group regardless of whether the patient is treated in the indoor disease room or pulmonary chamber.

2.3. Research Site

This research was conducted in the Pulmonary Disease Treatment Room and general care of Persahabatan Hospital Jakarta. The selection of this research site is because it is a type A hospital and is a national respiration referral center hospital. The hospital is a hospital that supports the development of science, so it is possible to do research at Rs Persahabatan Jakarta

2.4. Research Time

The research was conducted for 30 days, starting from the fourth week of October to the fourth week of November 2018. The schedule ofgitan conducted in this study in detail is in the appendix.

2.5. Research Ethics

As an ethical consideration researchers believe that respondents are protected, taking into account aspects; self determination, privacy, anonymity, informed consent and protection from discomfort [63].

1. Self determination.

   Respondents make the choice to participate in research activities voluntarily. Respondents are willing to be scrutinized, respondents sign consent sheets.

2. Privacy.

   The confidentiality of respondents' information is strictly maintained for research purposes only. Respondent's information is strictly guarded by keeping the information that can be from them only for research purposes.

3. Anonymity.

   During the research activity, the respondent's name was not used but only used the respondent's number instead.

4. Informed consent.

   The researchers explained the purpose and purpose of the research conducted as well as how to fill out the questionnaire. Respondents willing to participate in the study signed a consent sheet to be the subject of the study.

5. Protection from discomfort.

   Respondents are free from discomfort. Respondents felt safe and comfortable during the study did not cause symptoms / psychological problems, then to the respondent was asked the choice namely; participation or continue, accompanied by psychological intervention from a nursing counselor (adviser I). The risk that may arise in respondents in this study is shortness of breath, if the exercise is done too long so that the respondent is exhausted. Although it has been taught to smooth the implementation of pursed lips breathing avoiding errors in its implementation, the intervention group will be given a booklet on the procedure of implementing pursed lips breathing at the beginning of the study, so that when self-training can

be used as a guide. The control group will be taught and given a booklet on the procedure of conducting pursed lips breathing after the research is completed, so that the control group respondents can perform this exercise after the research is complete.

This aims to avoid ethical violations against the control group, as all respondents have equal rights. In addition, researchers have obtained approval (passed an ethics review) from the nursing research ethics committee of the Persahabatan Hospital, Jakarta, in an effort to protect the rights and well-being of respondents (attached certificate).

2.6. Data Collection Tool

2.6.1. Data Collection Tool

Data about research variables obtained is primary data in the following ways:

1. Characteristics of respondents covering age and gender were obtained by asking 2 questions filled out by researchers on the questionnaire
2. Oxygen saturation is measured by observing the oxygen saturation value measured by the oxymeter and the results are recorded in the questionnaire.
3. Height is measured by microtoice and measurement results are recorded in questionnaires

The quality of the data is determined by the validity and reliability of the measuring instrument. Validity is validity, which is how close the measuring instrument says what should be measured [39, 72]. While reliability is the reliability or accuracy of measurements. A measurement is called reliable, if it gives the same or almost the same value when the examination is performed repeatedly [72]. This research is to reduce random errors and improve measurement reliability using three strategies, namely; standardization of measurement, instrument enhancement, and repeating measurements.

Validity is achieved using a measuring instrument that corresponds to what is measured, such as; Oxygen saturation measurement is measured using an oxymeter. Measurement of respondent's height using Microtoice Oxymeter and Microtoice tool before calibration is used.

Efforts to avoid the respondent's obscurity in carrying out the procedure, performed instrument trials on patients who had characteristics similar to those of respondents. Reliability is achieved by the use of oxymeters, and weight scales used in this study; brand and type are the same. The procedure of conducting pursed lips breathing was designed by researchers by referring to the theory [41] and Hoeman [46] can be seen

in the appendix. The procedure of seding based on PDPI theory [48] and Perry & Potter [60] can be seen in the appendix.

2.7. Data Collection Procedures

COPD degree data and respondent characteristics were collected by researchers and or research assistants. The intervention was carried out directly by researchers assisted by research assistants who had previously passed training, and worked closely with room nurses, doctors who treated respondents, respondents and families. Data collection procedures are carried out as follows;

2.7.1. Selection of research assistants

1. Research assistant is a nurse who is educated in S1 or D3 nursing and has experience treating COPD patients for at least 1 year on the grounds that nurses who have worked 1 year have experience treating copd patients who are adequate.
2. Following and having passed training conducted by researchers on the implementation of pursed lips breathing and the way of measurement of APE using peak ekspiratory flow meter.
3. This study was assisted by three research assistants who have passed training on the implementation of pursed lips breathing, consisting of 2 nurses, namely; 1 S1-educated nurse, and 1 D.III-educated person

2.7.2. Administrative procedures

1. Data collection is done after obtaining permission from the head of Jakarta Friendship Hospital as a research site, and obtaining permission from each ward head.
2. Socialize research on doctors, headrooms and nurses who serve in the space conducted by research, about the intentions, objectives, and procedures of research. Upon completion of the explanation, an agreement was made to provide pursed lips breathing intervention in patients who met the inclusion criteria.

2.7.3. Intervention procedure

After the administrative procedure is complete, the following actions are taken;

1. Choose copd patients who meet the inclusion criteria to be used as respondents.

2. Ask potential respondents who have been selected, to be willing to be respondents after getting an explanation of the objectives, benefits, research procedures, and rights and obligations when being an informed consent. Give respondents the opportunity to ask questions. If the prospective respondent is willing, they are then asked to sign an informed consent sheet. Then the researcher told the head of the room and the nurse who served in the room that the patient was the respondent.

3. Designate respondents as intervention groups or control groups based on the order of respondents, odd sequences as control groups and even sequences as intervention groups.

4. Researchers ask about the characteristics of the respondent and fill out the characteristics of the respondent in the questionnaire.

5. Measure height in both intervention and control groups and record measurement results on questionnaires.

6. Measuring oxygen saturation in both intervention and control groups before pursed lips breathing was performed and recorded the measurement results on the questionnaire.

7. Intervention group.

   Get nursing care from the room nurse and pused lips breathing action. Researchers and or research assistants teach pursed lips breathing procedures using booklets, with lecture, q&A, and demonstration methods. Researchers or research assistants accompanied the respondents to pursed lips breathing for ± 15-20 minutes every day for 6 days. Researchers asked respondents to do it themselves twice outside of mentoring by referring to the pursed lips breathing procedure box that had been given, for the format of self-training evaluation can be seen in the appendix. Respondents measured oxygen saturation on the first day of being assigned as respondents and measured before getting pursed lips breathing intervention then oxygen saturation was re-measured after 6 days of pursed lips breathing intervention. Measurements of oxygen saturation using Oxymeter and results were documented in questionnaires.

8. Control Group

   Get nursing care from the nurse's room. Each day respondents measured oxygen saturation using 0xymeter and the results were documented in questionnaires. This is done on the first day set as the respondent then his oxygen saturation is measured again after 6 days.

9. The final evaluation was conducted after pursed lips breathing on the sixth day, measuring oxygen saturation using Oxymetry in both the intervention and control groups.

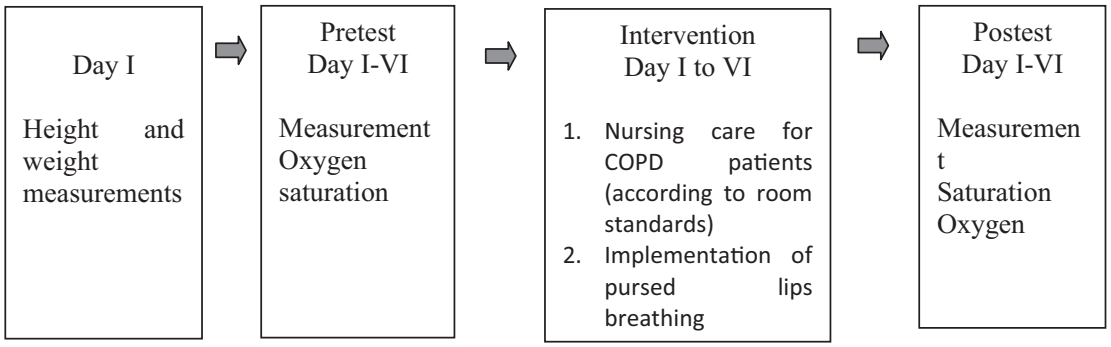

Figure 2: The Course of Intervention Group Research

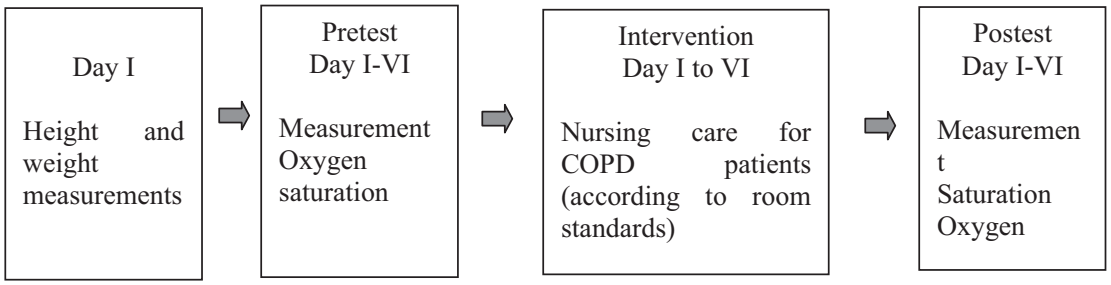

Figure 3: The Course of Control Group Research

2.8. Data Analysis

The data that has been collected before being analyzed, first do the following;

1. Editing.

   Editing the data to ensure that the data obtained is complete theorization of all and can be read properly. Done by correcting the data that has been obtained include: the correctness of the filling, the completeness of the answer to the width of the questionnaire.

2. Coding.

   Code each variable to make it easier for researchers to tabulate and analyze data, namely providing respondents with code (resp), intervention group (1) and control group with code (2).

3. Tabulating.

The data is grouped by a specified category, then the data is tabulated. By means of each questionnaire is done coding for statistical analysis purposes using the help of a computer

4. Entry data.

   It is a process of inserting data into the computer to further analyze the data using computer programs.

5. Cleaning data.

   The data that has been entered into the computer program is cleaned up so that all the data obtained is free from errors before the analysis is performed.

Analysis conducted includes

1. Univariate Analysis

   The purpose of this analysis is to describe each of the variables studied, for numerical data covering age, height and oxygen saturation by calculating mean, median, standard deviation (SD), and minimum and maximum values, as for categorical data by calculating frequency and percentage. Test each variable using a table and interpret it based on the results obtained.

2. Bivariate Analysis

   Bivariate analysis was conducted to prove the research hypothesis that pursed lips breathing affects oxygen saturation in moderate and severe COPD patients treated at Jakarta Friendship Hospital

Before determining the type of bivariate analysis used, normality tests were first conducted for numerical data types (age, height and oxygen saturation).

Numerical data as a result of measurements generally follow normal distribution, but it is not impossible for a set of numerical data not to follow normal distribution assumptions, therefore to know it is done normality test with kologmorov smirnov test. If the research variable is distributed normally then the test used is a parametric statistical test, and if the data distribution is abnormal use a non-parametric statistical test. Statistical tests for all of the above analyses were analyzed with a rate of meaning of 95% (alpha 0.05%). The type of bivariate analysis used is more fully described in table 1.

3. Results

Table 1: Bivariate Analysis

Oxygen Saturation	Oxygen Saturation	Type Statistical Test
Oxygen saturation before intervensí in intervention group	Oxygen Saturation after intervensí in intervensí group	dependent sample test group (Paired t-Test)
Oxygen saturation in the control group on the first day	Oxygen saturation in the control group on day six	dependent sample test (Paired t-Test)
Oxygen saturation before intervensí in intervention group	Oxygen saturation in the control group on the first day	Independent sample test (Pooled t-Test)
Oxygen Saturation after intervensí in intervensí group	Oxygen saturation in the control group on day six	independent sample test (Pooled t-Test)

Table 2: Bivariate Analysis Between Respondent Characteristics (Confounding Variables) and Dependent Variables

No	Characteristics of Respondents (Confounding Factor)	Dependent Variable	Type Test Statistics
1	Age	Oxygen Saturation	Simple linear regression
2	Height	Oxygen Saturation	Simple linear regression
3	Gender	Oxygen Saturation	Independent sample test (Pooled t-Test)

Table 3: Analysis of The Effect of Pursed Lips Breathing On Increased Value Oxygen Saturation In Intervention and Control Groups (n=48)

No	Saturasi Oksigen	Kelompok	Mean	SD	n	t	p Value
1	Before	Intervention	92.92	0.73	24	-0.77	0.000
2	After	Control	94.95	0.95	24	-1.67	0.000

3.1. The Effect of Pursed Lips Breathing on Increased Oxygen Saturation Value

From table 3 clearly illustrated the influence of pursed lips breathing on the increase in oxygen saturation value, can be seen from the difference in the average value of oxygen saturation from both groups before and after pursed lips breathing for six days. The average increase in grades in the control group was lower compared to the intervention group.

The average oxygen saturation value in the intervention group before pursed lips breathing was 92.92 % with a standard deviation of 0.73 %. The measurement after pursed lips breathing obtained an average oxygen saturation is 95.17 % with a standard deviation of 0.62 %. The results of the two-mean statistical test for two paired t-tests showed a significant difference in oxygen saturation value after six days of pursed lips breathing (P=0.000, α=0.05). This hypothesis is reinforced by the average difference in oxygen saturation values before and after pursed lips breathing which showed an increase of 9.38%. Although the increase is not very high, it is very meaningful for COPD patients.

The average oxygen saturation value in the control group before pursed lips breathing was 93.78 % with a standard deviation of 0.42%. The measurement after pursed lips breathing obtained an average oxygen saturation is 95.17 % with a standard deviation of 0.61 %. The mean value of the difference between oxygen saturation before and after intervention is 9.37% with a standard deviation of 0.947 %. The oxygen saturation value before pursed lips breathing is different from after pursed lips breathing in the control group (p=0,000, α=0.05).

The increased value of oxygen saturation in COPD patients from before intervention to day six intervention, in both the intervention group and the control group can be seen in Figure 5.1

Figure 3.1 Average Development of Oxygen Saturation During Six Days of Pursed Lips Breathing In Intervention and Control Groups In Hospitals (n=48)

Figure 5.1 explains that the oxygen saturation of COPD patients varies over six days, both in the intervention group and the control group. Oxygen saturation in both groups increased daily, on the first day to the third day increased quite high while on the third to fourth day it rose only 0.12% in the intervention group and 0.16% in the control group. On the fourth to sixth day the oxygen saturation value rose quite high again, and the intervention group increased higher. To measure the effectiveness of pursed lips breathing in improving oxygen saturation of COPD patients after intervention, the following formula can be used;

$$E = \frac{\text{Increased average oxygen saturation after intervention}}{\text{Number of respondents}} \times 100\%$$

Then in the intervetion group we can count as follows;

$$E = \text{—} \times 100\% = 9.38\% \quad \frac{2.25}{48}$$

From the calculation, it can be explained that the effectiveness of pursed lips breathing by 9.38 %, meaning pursed lips breathing can increase oxygen saturation by 9.38%.

3.2. Difference in Average Oxygen Saturation Value in Intervention and Control Group before and after Pursed Lips breathing

The following table 4 outlines the average oxygen saturation values between intervention groups after six days of pursed lips breathing with the control group. The average difference in the oxygen saturation score of the intervention group after pursed lips breathing with the control group, analyzed using a statistical test of two pooled t-tests.

The average oxygen saturation value before pursed lips breathing between the intervention group (oxygen saturation average of 92.92% with a standard deviation of 0.73) and the control group (oxygen saturation average of 93.78% with a standard

Table 4: Analysis of Differences in Average Oxygen Saturai Value of Intervention Group and Control Before Pursed Lips Breathing (n=48)

Saturasi O2	Variable	Mean	SD	p Value
Before Pursed Lips	1. Intervention	92.92	0.73	0.048
Breathing	2. Control	93.78	0.42	

deviation of 0.42), means the oxygen saturation of the intervention group is lower by 0.86%. The results of the two pooled t-tests found there was a difference in oxygen saturation before pursed lips breathing between the intervention group and the control group ($p = 0.048$, $\alpha = 0.05$)

Table 5: Analysis of Differences in Average Oxygen Saturai Value of Intervention Group and Control After Pursed Lips Breathing (n=48)

Saturasi O2	Variable	Mean	SD	p Value
After Pursed Lips	1. Intervention	95.17	0.61	0.012
Breathing	2. Control	94.95	0.95	

The average oxygen saturation value after pursed lips breathing in the intervention group was 95.17% with a standard deviation of 0.61, and the control group averaged oxygen saturation of 94.95% with a standard deviation of 0.95, meaning the intervention group was 0.22% higher than the control group. The oxygen saturation values of COPD patients in the intervention group differed significantly with the control group ($p = 0.012$, $\alpha = 0.05$)

Table 6: Analysis of The Difference in Average Oxygen Saturai Value Before and After Six Days of Treatment in the Control Group (n=48)

Variable	Mean	SD	p Value
1. Before	93.78	0.42	0.023
2. After	94.95	0.95	

The average oxygen saturation value after six days of treatment in the control group was 94.95% with a standard deviation of 0.95 and before six days of treatment the average oxygen saturation was 93.78 % with a standard deviation of 0.42 meaning the group after six days of treatment was 1.17% higher than the group before six days of treatment. The oxygen saturation value of COPD patients in the group after six days of treatment differed significantly with the group after six days of treatment ($p= 0.023$, $\alpha = 0.05$)

Table 7: Analysis of The Difference in Average Oxygen Saturai Value Before and After Pursed Lips Breathing on Intervention Group (n=48)

Variable	Mean	SD	p Value
1. Before	92.92	0.73	0.031
2. After	95.17	0.62	

The average oxygen saturation value after pursed lips breathing in the intervention group was 95.17% with a standard deviation of 0.62 and before pursed lips breathing the average oxygen saturation was 92.92% with a standard deviation of 0.73 meaning the group after pursed lips breathing was 2.25% higher than the group before pursed lips breathing. The oxygen saturation value of COPD patients intervention group before pursed lips breathing differed significantly with after pursed lips breathing ($p = 0.031$, $\alpha = 0.05$)

3.3. Respondent's Characteristic Relationship (Age, Height) To Increased Oxygen Saturation After Pursed Lips Breathing In Intervention Group and Control Group

The test of the average increase in oxygen saturation scores after pursed lips breathing in both groups was intended to identify how much difference the average increase in scores gained after obtaining pursed lips breathing, and compared the changes with the control group that did not get the intervention. Age and height characteristics were analyzed using a simple linear regression test (see table 5.13), and gender using the independent sample t test (see table 5.14).

Table 8: Analysis of Age and Height Relationship to Average Improvement Oxygen Saturation Value After Pursed Lips Breathing In the Intervention and Control Group (n=24)

No	Variable	r	R Square	Persamaan	p Value
1	Age	- 0,73	0,536	SO2=125,941,238*Age	0.001
2	Height	0.42	0.178	SO2=222,56+1,045*Height	0.091

The age relationship to the increased oxygen saturation value of COPD patients after pursed lips breathing showed a strong relationship (r=-0.73) and negative patterned, meaning the lower the age the lower the oxygen saturation value. The coefficient value of determination is 0.536 which means that age is able to explain the increase in oxygen saturation by 53.6%. The results of a simple linear regression test statistical test found there was a significant relationship between age and increased oxygen saturation value of COPD patients ($p = 0.001$, $\alpha = 0.05$).

The equation can be used to estimate the oxygen saturation value of COPD patients after pursed lips breathing by utilizing the value of age variables. The regression line equation in table 8, meaning that every one-year increase in age, the oxygen saturation value of COPD patients will decrease by 1,238%

The relationship between the height of COPD patients to increased oxygen saturation after pursed lips breathing has a moderate (r=0.42) positive pattern with an increase in oxygen saturation value, meaning the higher the COPD patient's body size the higher the oxygen saturation value. Height means in proportion to increasing the value of

oxygen saturation, but statistical test results towards height do not affect the increase in oxygen saturation of COPD patients.

3.4. Gender Relationship Analysis of Average Increase in Grades Oxygen Saturation After Pursed Lips Breathing In the Intervention and Control Group

TABLE 9: Gender Relationship Analysis of Average Increase in Grades Oxygen Saturation After Pursed Lips Breathing In the Intervention and Control Group (n=24)

Gender	Mean	SD	n	t	p Value
Male	2.20	0.828	22	-1.010	0.346
Female	2.67	0,822	2		

The average oxygen saturation score after pursed lips breathing of male patients was 2.20 with a standard deviation of 0.828 while in women the average oxygen saturation value was 2.67 with a standard deviation of 0.822. This means that the average oxygen saturation value after pursed lips breathing is higher in women than in men. Gender had no effect in increasing the oxygen saturation value of COPD patients after pursed lips breathing ($p=0.346$, $\alpha=0.05$).

4. Discussion

4.1. The Effect of Pursed Lips Breathing on Increased Oxygen Saturation

The average oxygen saturation rate in intervention group COPD patients before pursed lips breathing was 92.92% and after pursed lips breathing for six days to 95.17%, meaning the oxygen saturation of COPD patients increased after pursed lips breathing. While in the control group the average oxygen saturation value before intervention was 93.78 % and after intervention of 94.95 %. Oxygen saturation of COPD patients in the control group and intervention group both rose, but the increase in the intervention group (2.24 %) higher than the control group (1.18 %).

This shows that the nursing care received by COPD patients at Friendship Hospital Jakarta can increase the oxygen saturation of patients. The provision of nursing care to the control group is impossible for us to stop, because it will violate the right of the patient, so that the patients of both groups get nursing care according to the standards of Persahabatan Hospital Jakarta and the intervention group is added with pursed lips breathing. Nursing care provided to COPD patients includes; arranging sleep position, meeting oxygen needs, bronchial secretion management, and drug

delivery collaboration. Such actions can help improve oxygen saturation, especially bronchodilator drugs. Administration of beta agonists causes bronchodilation. Beta receptors are closely related to adenilsiklase, an important substance that produces cyclic AMP that inhibits the release of chemical mediators, thereby causing bronchodilation. Bronchial nerves originate and the parasympathetic system through vagus nervus, vagal reflex activity is considered the cause of bronchoconstriction; but the exact role of vagus is unknown. The nerve-delivery substance is acetylcholine that can cause bronchoconstriction. Atropine is a competitive antagonist and acetylcholine can give rise to smooth muscle relaxation of the bronchi so that bronchodilation arises [9].

Although in both groups oxygen saturation equally rose, but with the addition of pursed lips breathing the increase was higher 2.24%. this increase means a lot to COPD patients. This small increase can be due to the short exercise length of six days. We know that COPD patients experience respiratory obstruction which is generally progressive irreversibly or partially reversible, this results in carbon dioxide (CO2) levels in the lungs likely to settle high, so pursed lips breathing exercises are required for longer.

Statistical test results also showed lung oxygen saturation after pursed lips breathing intervention group differed meaningfully with the control group (P=0.012, α=0.05). The results of this study showed that nursing care provided to COPD patients at RSUP Persahabatan Jakarta has been able to increase oxygen saturation, but the increase in oxygen saturation of COPD patients will be higher when in the implementation of nursing care is more optimized, with the provision of pursed lips breathing action. The results have shown that pursed lips breathing has a significant effect in increasing the oxygen saturation of COPD patients (P=0,000, α=0.05). In addition, the effectiveness of pursed lips breathing by 2.24 %, meaning pursed lips breathing can increase oxygen saturation by 2.24%. Pursed lips breathing is a strategy used in pulmonary rehabilitation to lower shortness of breath by means of relaxation. COPD patients will benefit when using this technique, as this strategy was created aimed at; help patients control breath patterns, improve ventilation to improve the effectiveness of breath patterns, improve effective cough mechanisms, prevent atheisttasis, increase respiratory muscle strength, increase relaxation and prevent recurrence and shortness of breath [22, 41, 45, 64].

In addition pursed lips breathing can also improve the quality of life of patients, because after doing this exercise regularly, copd patients will be able to control their shortness of breath so that they can live normally. This supported the results of thomas et al (2003) research on 33 asthma patients who did pursed lips breathing for 6 months found quality of life (measured using Nijmegen questionnaire scores) patients increased with P value of 0.018 in alpa = 0.05. Bruton and Stephen's research (2005) on asthma

patients resulted in pursed lips breathing having an effect in addressing hypocapnia problems in asthma patients (P=0.002, α=0.05).

The average COPD patient experienced an increase in airflow, water trapping, and pulmonary hyperinflation. Pulmonary hyperinflation causes mechanically inspiratory muscle loss, resulting in an increased imbalance between magnetic tasks in breathing, strength and the ability of breathing to meet tidal volume. Therefore pursed-lip breathing is necessary, and during Pursed-lip breathing, no respiratory air flow occurs through the nose due to the involunter blockage of the nasopharyngeal by soft palatum. Pursed-lip breathing creates obstruction to exhalation airflow and increases air resistance, lowers the gradient of transmural pressure and maintains a patented airway that is coexistent during exhalation. This process helps reduce trapped air expenditure, so as to control expiation and facilitate maximum emptying of alveoli [22, 64].

This research supports the results of research conducted by Enright, Chatam, & Ionescu (2004) in Australia on COPD patients who are not hospitalized, produced average pulmonary faal function of 60% after pursed-lip breathing and respiratory muscle training for 8 weeks, (Enright, Chatham, & Ionescu, 2004, Respiratory muscle training and prused- lip breathing improves lung function and exercise capacity in adults with COPD, http://www.chestnet.org, Obtained october 19, 2008).

Pursed-lip breathing does not directly decrease the functional capacity of residues, but the improvement of shortness of breath is a result of the restoration of the diaphragm to the position of the contracting thorak. Pursed-lip breathing also improves breathing work. Reinforced during the implementation of the study, the record of interview results against the intervention group patients (although not in the research questionnaire) most patients said they felt comfortable when using pursed lips breathing techniques, the results of previous studies conducted by Tiep et. Al. in Hoeman [41] who conducted pursed-lip breathing research in COPD patients said that arterial oxygen saturation (SaO2) increased by about 15-30%, and felt less shortness of breath. But for patients who do not exercise often have difficulty applying this technique when a shortness of breath attack arises. This study supports patients by revealing the benefits of feeling comfortable and shortness of breath reduced after following the study. It also supports research on the implementation of pursed- lip breathing in COPD patients after ventilator use, un formally reported patients experiencing decreased breathing frequency, and increased volume of tidal [22, 64].

Due to prolonged shortness of breath and the work of breathing aids muscles cause copd patients to experience strain on the muscles of the body, so relaxation is necessary. Relaxation of muscles can decrease contractions, relaxation of tendons can stimulate the body and impact the inhibition of neurons that control muscles, this effect is known as myotatic inverse reflexes (McCance & Hueter, 2006). Relaxation techniques in addition

to aiming to relax the tension of the breathing aid muscles, decrease the use of energy in breathing that can increase breathing work, as well as to lower the anxiety of COPD patients due to shortness of breath experienced [45]. Copd patients in this study also expressed comfort after doing relaxation techniques, they said the technique is easy to do even while sleeping, watching TV, or chatting.

In addition to relaxing muscles, pursed-lip breathing, also performed diapragma breathing exercises, this technique focuses on the use of diaphragm muscles instead of accessories muscles to achieve maximum inspiration and lower breathing frequency. The purpose of diaphragm breathing is; strengthens diaphragm muscles, coordinates diaphragm movement while breathing, reduces breathing effort, and decreases energy use in breathing [46]. As a result of this study, patients said they felt uncomfortable doing diaprgama breathing during asphyxiation attacks, but when this technique was performed after an acute attack decreased the patient said it could regulate/control the speed and depth of breathing. Contraction of abdominal muscles during acute shortness of breath increases the burden of breathing energy and is difficult to coordinate during activity.

Based on the development of examination of the ventilation function of the patient's lungs, on the third and fourth days of both the intervention and control group there was a very small increase, this can be caused because the average condition of the patient is de decreased and the patient has not been fully able to perform pursed lips breathing exercises.

4.2. Age Relationship with Increased Oxygen Saturation of COPD Patients

Chronic obstructive pulmonary disease (COPD) is a chronic disease characterized by the inhibition of airflow in the airways that is nonreversial progressive or partially reversible [48]. 1). From this understanding it is known that COPD patients experience airflow barriers, which can lead to loss of recoil as well as increased respiratory tract resistance. COPD often becomes symptomatic during early adulthood, but its incidence increases in line with the increase in age.

The results showed age had a significant relationship in improving the pulmonary ventilation function of COPD patients after pursed lips breathing ($P=0.001$, $\alpha=0.05$). This research supports guyton and hall theory [36]; Hudak and Gallo [42] who said, the older a person is, the saturation of oxygen will decrease, this is due to the elasticity of the chest wall is decreasing. During the aging process there is a decrease in alveoli elasticity, thickening of the bronchial glands, decrease in pulmonary capacity and an increase in the amount of space loss [75].

Although certain aspects of the lungs, such as vital capacity and strong expiation volume or peak current aspiration decrease in line with increased age, COPD will also exacerbate many physiological changes associated with aging and result in airway obstruction (in bronchitis) and loss of pulmonary attraction to emphysema [75]. Therefore the older the increase in the ventilation-perfusion ratio of COPD patients. This condition can cause shortness of breath during activity and decreased airflow in and out of the lungs, which is irreversible. The results of the study in the regression line equation in table 5, showed that every increase in the age of one year, then the value of pulmonary ventilation function of COPD patients will decrease by 1,238%. This supports the results of literature, research at Persahabatan Hospital, saying the value of FEV1 in COPD patients decreased by 52 ml each.

The age range of respondents in this study was 54-87 years, this is in accordance with the theory of Lewis, Driksen, and Heitkemper [46] who said Onset occurred COPD at the age of 30. In addition, the World Health Organization (WHO) estimates ± 1% of people between the age of 45-60 years, and ± 4% of people over the age of 60 suffering from COPD [70].

Stress is one of the causes of recurrence in COPD patients, because stress stimulates B lymphocytes so that it becomes plasma cells. When this process continues plasma cells will form IgE that is ficasi by mast and basophil cells in the tracheobronchial tract, this will result in mast cells releasing chemical mediators (histamine, bradykinin, prostaglandins, and show releasing substances of anaphilaxis (SRS-A), then this chemical mediator will result in bronchial constriction, hypersecretion, and edema on the bronchial walls [13].

The second most age is late adulthood or we commonly call the elderly. According to Guyton and Hall [36]; Hudak and Gallo [42], the older a person is, the lower his pulmonary ventilation function. This is due to the decreased elasticity of the chest wall, increased chest anteroposterior diameter, osteoporotic colap vertebrae resulting in kifosis (increased spinal curve), calculus calculification of costa caltilago and decreased motility of kosta, decrease in respiratory muscle efficiency, increased pulmonary rigidity, and decreased surface area of alveoli.

Increased rigidity or loss of pulmonary elastic recoil results in increased residual pulmonary volume and decreased lung vital capacity. During the aging process there is a decrease in alveoli elasticity, thickening of the bronchial glands, decreased pulmonary capacity and an increase in the amount of space loss. This change led to a decrease in oxygen diffusion capacity [75].

Related to exercise ability, stating that the age and severe condition of the disease is also an influential factor in determining the intensity of exercise. Therefore the age and weight of COPD are two indicators that directly contribute to the ability of patients to

pursed lips breathing. In addition, motivation can also influence learning outcomes, according to Sullivan [16] participants who have high desire will be ready to learn and the learning process more productive so that the results are more effective. This corresponds to the results of the study, where age has a very significant effect (P=0,001, α=0.05) on improving pulmonary ventilation function. This age has a strong influence (r=0.73) and is negatively patterned, which means the older the age the lung ventilation function decreases.

4.3. Height Relationship with Increased Saturation

Height is not directly related to the onsanion of COPD or recurrence of COPD, but height is related to the anatomy of the lungs, especially the surface area of the lungs. A person whose height is large then the ventilation function of his lungs is higher than that of a person of short stature [36]. The results of this study explain that the average height of COPD patients has a moderate (r=0.42) positive pattern with increased oxygen saturation, meaning the higher the height, the more oxygen saturation increases. The increase in oxygen saturation was determined by a height of 17.8%, and statistical test results showed no relationship (P=0.091) between height and increased oxygen saturation of COPD patients. This leads to a significant proportion of the oxygen saturation of COPD patients, but it is statistically meaningless.

The results of this study do not mean that height does not affect the oxygen saturation of COPD patients, but height does not affect the increase in oxygen saturation in COPD patients after pursed lips breathing. This condition can be caused because the saturation values used in this study are the percentage of oxygen saturation values obtained from the measurement results divided by normal values that have been adjusted for the age, height, and gender of each respondent

4.4. Sex Relations with Increased Oxygen Saturation

Most COPD patients are male, and the main cause is smoking [13]. The observation sparked an increase in the number of COPD patients as the smoking trend emerged, in the United States, 80% - 90% of COPD patients who died were smokers, and among them 70% were male [46]. This is not much different from Indonesia where most COPD sufferers are male and on average are smokers. Supported by study, teenagers start smoking from less than 10 years old and most are male. The results showed 21 out of 34 male COPD patients (61.8%), but in this study researchers did not dig into how many patients had a history of smoking. However, based on unstructured conversations during the study (not included in the questionnaire) many male patients were revealed

to have a history of smoking, so researchers assumed that male COPD patients smoked more often than women.

Smoking is the main cause of COPD patients [13]. Cigarette smoke irritates the airway, resulting in mucus hypersecretion and inflammation. This constant irritation, causing the glands that secrete mucus and goblet cells to increase in number, cilia function decreases, and more mucus is produced. As a result bronchiolus can become damaged and form fibrosis, resulting in changes in alveolar macrophag function, which plays an important role in destroying foreign particles, including bacteria. Further bronchial narrowing occurs due to fibrotic changes occurring in the airway. Over time there may be irreversible pulmonary changes, possibly resulting in emphysema and bronchiektasis [64).

Men's lung ventilation function is 20% - 25% higher than in women, because the anatomical size of the male lung is greater than that of women. In addition, male activity is higher than that of women, so recoil and lung compliance have been trained [13]. Although in theory the value of male oxygen saturation is higher than that of women, in this study obtained the opposite result namely; in men the average oxygen saturation value is 93.83%, while in females it is 94.99%. Statistical test results also showed no relationship between the sexes with an increase in oxygen saturation values (P=0.346, α=0.05).

This is due to several things; 1) The value of pulmonary ventilation function used in this study is a percentage of the oxygen saturation value obtained from the measurement results divided by normal that has been adjusted to the age, height, and gender of each respondent. In fact, if we look at the results of the test the value of oxygen saturation that has not been percentageed, between men and women is higher in men. 2) The weight of copd degrees between men and women, in this study patients copd degrees heavier more suffered by men, this could also be due to most men smoking.

5. Conclusion

As outlined in chapter I on the benefits of research, in fact scientific research contains two benefits namely; theoretical benefits and practical benefits, and both benefits are a condition of a study. Therefore both of these benefits should be implications for further service and research.

1. Implications for Nursing Services

   After COPD patients did pursed lips breathing for six days it turned out to benefit, among them patients revealing feeling more comfortable, less shortness of breath, and what can be seen in this study is the increase in the value of oxygen saturation.

The implementation of pursed lips breathing is very easy, does not require special equipment, and can be done anywhere. In addition pursed lips breathing is a nursing intervention aimed at established the patient even indirectly, because if the COPD patient no longer has impaired lung ventilation function will be tolerant of activity, so as to meet his own needs.

Patients can pursed lips breathing independently after being taught beforehand. This intervention is one of the applications of the self care theory of D.E. Orem. This theory of self care assumes that 1) man needs input for himself and his environment; 2) the ability to do something it needs to be trained in nursing care for herself and others; 3) adults also sometimes experience limitations to care for themselves and others; 4) humans are born, developed and able to care for themselves and others [85].

Seeing these benefits needs to be developed by pursed lips breathing in COPD patients in hospitals and at home. Nurses can teach this technique from the beginning of the patient's admission, not having to wait for the patient to be consulted to the medical rehabilitation department first, because it takes time and not all patients are consulted into medical rehabilitation. Patients can also do this exercise at home during relapse to treat shortness of breath or when not relapsed to improve oxygen saturation so that the patient's quality of life improves.

This research is expected to be a consideration in making decisions. Nursing managers in the health care order are expected to include pursed lips breathing in the nursing care standards (SAK) of COPD patients, as well as create operational standards of procedure (SOP) or permanent procedure (protap). If pursed lips breathing has been entered into SAK and there is already SOP, then there needs to be increased motivation for its implementation and supervision to evaluate the implementation of pursed lips breathing. Nursing managers engaged in education, it is expected that this research is considered as emphasized in the curriculum and to the students in order to master and be able to transform it when conducting nursing clinic practices in nursing service institutions.

2. Application to Scientific

The results of this study shed light on the effect of pursed lips breathing, combined pursed-lip breathing, diapragma breathing, and relaxation techniques, on improving pulmonary ventilation function. Interventions in this study were carried out for six days in copd patients who were hospitalized, for the foreseeable future can be done the same research but the length of time the intervention is extended. In addition, research can also be conducted on patients who are not hospitalized, in the sense that it is carried out on patients who are not in attack, as well as

the addition of other variables related to improved ventilation function of COPD patients.

Further research is needed with a larger number of samples, the same type of bronchodilator and the same degree of COPD weight, thus improving the patient's pulmonary ventilation function more due to the intervention effect, not because of the difference. Methodally can be done research with qualitative design, so that it can be excavated in depth the feelings and benefits felt by COPD patients after pursed lips breathing Need to be dug deeper about the length of time and duration of proper pursed lips breathing exercises in COPD patients that can provide optimal benefits in patients.

References

[1] Mukty, A. and Sampoerno, D. (September, 2016). Rehabilitasi pada Penyakit Paru Obstruktif Menahun. Presented at *Simposium dan Kursus Penyakit Paru Obstruktif Menahun, Surabaya, Republic of Indonesia.* J Indon Med Assoc, Volum: 66, Nomor: 9

[2] Abrosino, N., Foglio, K. and Bianci, L. (2016). *Pulmonary Rehabilitation Programs in COPD*. Retrieved from http://www.madscape.com/APNeJournal.

[3] Almatsier, S. (2007). *Penuntun diet: instalasi gizi perjan RS Dr. Cipto Mangunkusmo dan Asosiasi Dietisien Indonesia.* Jakarta: PT Gramedia Pustaka Utama.

[4] Alsagaff, H. and Mukty, H. M. (2015). *Dasar-Dasar Ilmu Penyakit Paru*. Surabaya: Airlangga University Press.

[5] American College of Chest Physicians. (2016). *Function Test of Lungs*. Retrieved from http://www.chest.com.

[6] American Psychological Association. (2016). *Publication Manual of the American Psychological Association* (5th ed.). Washington, D.C.: American Psychological Association.

[7] American Thoracic Society. (2015). Standards for Diagnosis and Care of Patient with COPD. American Journal of Respiratory and Critical Care Medicine , vol. 152, pp. 77-120.

[8] Ariawan, I. (2016). *Besar dan Metode Sampel pada Penelitian Kesehatan*. Jurusan Biostatistik dan Kependudukan. Jakarta.

[9] Aschenbrenner, D. S., Cleveland, L. W. and Venable, S. J. (2016). *Drug Therapy in Nursing*. Philadelphia: Lippincott Williams & Walkins.

[10] Barnes, P. J. (2000). Chronic Obstructive Pulmonary Disease. The New England Journal of Medicine, issue 343, pp. 269-80.

[11] Bekkering, G. E., *et al*. (2013). Clinical Practice Guidelines for Physical Therapy in Patients with Chronic Obstructive Pulmonary Disease. *In KNGF Guidelines for Physical Therapy in Patients with Chronic Obstructive Pulmonary Disease*, p. 1-33. UK: Physical Therapy Reviews

[12] Bianchi, R., *et al*. (2014). Chest Wall Kinematics and Breathlessness during Pursed Lips Breathing in Patients with COPD. *Chest*, issue 125, pp. 459-65.

[13] Black, J. M. and Hawk, J. H. (2016). *Medical Surgical Nursing; Clinical Management for Positive Outcomes*. (8th ed.). St. Louis: Elsevier. Inc.

[14] Bruton, A. and Holgate, S. T. (2015). Hypocapnia and Asthma; A Mechanism for Breathing Retraining. *Journal of American College of Chest Physicians*, issue 127, pp. 1808-1811.

[15] Hinkle, J.L., Cheever, K.H. (2014) *Brunner's and suddarth Textbook of Medical Surgical Sursing*. (12th ed.). Philadelphia: Williams & Wilkins.). Buist, A. S., *et al*. (2015) BOLD Collaborative Research, Colombia: The American College of Chest Physicians

[16] Chan-Yeung, M., *et al*. (2014). The Burden and Impact of COPD in Asia and Africa. *Internationational Journal Tuberculosis and Lung Disease*, vol. 8, p. 2-14.

[17] Comroe, J. H. (2015). *Physiology of Respiratory* (2nd ed.). Chicago: Year Book Medical Publishers.

[18] Craven, R.F, Hirnle, C.J. (2007). *Fundamentals of Nursing: Human Health and Function* (5th ed.). Philadelphia: Lippincott Williams & Wilkins.

[19] COPD International. (2014). *Co-morbidities in Chronic Obstructive Pulmonary Disease from Assessment to Treatment*. Retrieved February 25, 2018 from http: //www.copd-international.com/Lobrary/statistic.htm.

[20] Cuccurullo, S.J. (2014). *Physical Medicine and Rehabilitation Board Review* (3rd ed.). New York, Demos Medical Publishing

[21] Dechman, G. and Wilson, R. (2014). Evidence Underlying Breathing Retraining in People with Stable Asthma. *Physical Therapy Journal*, vol. 84, issue 12, pp. 1189-1197.

[22] Dempsey, P.A, Dempsey. A.D. (2002). *Riset Keperawatan: Buku Ajar & Latihan* (4th ed.). Jakarta: EGC.

[23] Durand, D. J. and Phillips, B. L. (2016). Blood Gases: Technical Aspects and Interpretation. In J. P. Goldsmith and E. H. Karotkin (Eds.), *Assisted Ventilation of the Neonate* (3rd ed.). Philadelphia: Saunders, pp. 257-71.

[24] Erstad, S. (2015). *Pulmonary Rehabilitation for COPD*. Retrieved February 10, 2017 from http://health.msn.com.

[25] Enright, C. and Ionescu, A.A. (2014). *Inspiratory Muscle Training and Prused Lip Breathing Improves Lung Function and Exercise Capacity in Adults with COPD*. Retrieved February 10, 2017 from http://www.chestnet.org.

[26] Fishman, A. P. (2014). Pulmonary Rehabilitation Research. *American Journal of Respiratory and Critical Care Medicine*, issue 149, p. 825833.

[27] Fregonezi, G. A, Resqueti, V. R. and Rousa, R. G. (2014). Pursed Lips Breathing. *Arch Broncopneumol*, issue 40, pp. 279-82.

[28] Garntan, S. L. (2016). Chest Physical Therapy Treatment of the Patient with Chronic Obstructive Pulmonary Disease. In H. Haas and K. Axen (Eds.), *Pulmonary Therapy and Rehabilitation, Principles and Practice* (2nd ed.). Baltimore: Williams and Wilkins, p. 213236.

[29] Gosselink, R. (2013). Controlled Breathing and Dyspnea in Patients with Chronic Obstructive Pulmonary Disease (COPD). *Journal of Rehabilitation Research and Development*, vol. 40, issue 5, pp. 25-34.

[30] Gracia-Aymerich, J. (2001). Risk Factors for Hospitalization for a Chronic Obstructive Pulmonary Disease Exacerbation. *American Journal of Respiratory and Critical Care*, vol. 164, issue 6, pp 125 137.

[31] Buist, S. A. *et al*. (2017). Group, International Variation in the Prevalence of COPD (the BOLD Study): A Population-based Prevalence Study. *Lancet*, issue 370, pp. 741-50

[32] Brindley, J. (2013). *Breathe Well and Live Well with COPD: A 28-Day Reathing Exercise Plan*. Retrieved February 10, 2017 from org/10.1016/j.cities.2005.01.001/j.cities.2005.

[33] Grove, S. K., Burns, N. and Hegstand, L. N. (2013). *Instructor's Manual to Accompany: The Practice of Nursing Research, Conduct, Critique and Utilization* (2nd ed.). Philadelphia: W.B. Saunders Company.

[34] Guyton, K. Z. (2016). *Human Physiology and Deseases Mechanism* (11th ed.). Jakarta: Penerbit Buku Kedokteran EGC.

[35] Haller, M., *et al*. (2014). Contunous Intra –Arterial Blood Gas and PH Monitoring in Critically Ill Patients with Severe Respiratory Failure: Propective, Criterion Standard Study. *Critical Care Med*, vol. 22, pp. 280-7.

[36] Martinez, F.D.*et al*. (2015). *Diagnosis and Treatment of Mild to Moderate COPD*. Retrieved February 10, 2017 from http://intap.medscape.com/px.medline.

[37] Hastono, P. (2016). *Modul Analisa Data*. Depok: Tidak Dipublikasikan.

[38] Hay, F. (2015). *Breathing Excercise*. Retrieved February 10, 2017 from http://www.pocketmentor.co.uk.

[39] Hoeman, S. P. (2016). *Rehabilitation Nursing: Process and Application* (2nd ed.). St. Louis: Mosby.

[40] Hudak, C.M, Gallo, B.M. (2015). *Critical Care Nursing: A Holistic Approach*. Philadelphia: J.B. Lippincott Company.

[41] SE Huether, S.E., McCance, K.L (2016). *Understanding Pathophysiology*. St. Louis: Mosby.

[42] Indelicato, R. A. (2017). *The Advanced Practice Nurse's Role in Palliative Care and Management of Dypsnea*. Retireved Retrieved February 10, 2017 from http://www.medscape.com/APNeJournal.

[43] Kisner, C. and Colby, L. A. (2016). *Therapeutik Exercise; Foundations and Techniues*. Philadelphia: F. A. Davis.

[44] Lewis, S. M., Heitkemper, M. M. and Direksen, S. (2016). *Medical Surgical Nursing; Assessment and Management of Clinical Problem* (5th ed.). St. Louis: Cv. Mosby.

[45] Luckman, S. (2015). *Medical Surgical Nursing, A Phsyco Physiologic Approach*. (4th ed.). Philadelpia: WB. Saunders Company.

[46] Mangunnegoro, H., *et al*. (2014). *PPOK Pedoman Diagnosis dan Penatalaksanaan di Indonesia*. Jakarta: PDPI.

[47] McCloskey, J. C. and Bulechek, G. M. (2016). *Nursing Interventions Classification (NIC)* (2nd ed.). St. Louis: Mosby.

[48] McMorrow M.E. and Malarkey, L. M. (2016). *Nurses's Manual of Laboratory Tests and Diagnostic Procedures* (2nd ed.). Philadelphia: W.B. Saunders Company.

[49] Morgan, M. D. L. and Britton, J. R. (2013). Chronic Obstructive Pulmonary Disease: Non-Pharmacological Management of COPD. *Thorax*, vol. 58, pp. 453-7.

[50] Notoatmojo, G. (2005). *Metodologi Kesehatan*. Jakarta: Rineka Cipta.

[51] Pagana, K. D. and Pagana, T. J. (2016). *Diagnostic Testing and Nursing Implications: A Case Study Approach* (5th ed.). St. Louis: Mosby.

[52] Mulyono, D. (2017). Rehabilitasi Pada Penderita Penyakit Paru Obstruksi Menahun. *Cermin Dunia Kedokteran*, issue 114, pp. 33-6.

[53] Nici, L., *et al*. (2016). American Thoracic Society/European Respiratory Society Statement on Pulmonary Rehabilitation. *American Journal of Respiratory and Critical Care Medicine*, vol. 173, pp. 1390-413.

[54] Orozco, M. (2010). *American Journal of Respiratory and Critical Care Medicine*, vol. 164, pp 141-147

[55] Park, S. (2016). *Pulmonary Rehabilitation for COPD*. Retrieved February 10, 2017 from http://health.msn.com.

[56] Perhimpunan Dokter Paru Indonesia. (2016). *Asma: Pedoman Diagnosis dan Penatalaksanaan Di Indonesia*. Jakarta: Balai Penerbit Fakultas Kedokteran Universitas Indonesia.

[57] _____. (2013). *PPOK; Pedoman Diagnosis dan Penatalaksanaan di Indonesia*. Jakarta: Balai Penerbit FKUI.

[58] Perry, A. G. and Potter, P. A. (2014). *Clinical Nursing Skills Techniques* (4th ed.). St. Louis: Mosby

[59] _____. (2015). *Fundamentals of Nursing: Concepts, Process, and Practice. Diterjemahkan oleh Yasmin Asih* (4th ed.). Jakarta: Penerbit Buku Kedokteran EGC.

[60] Petty, T. L. (1993). Pulmonary Rehabilitation in Perspective: Historical Roots, Present Status, and Future Projections. *Thorax*, vol. 48, p. 855862.

[61] Pollit, D. F. and Beck, C. T. (2016). *Essentials of Nursing Research: Methods, Appraisal, and Utilization*. (6th ed.). Philadelphia: Lippincott Williams & Walkins.

[62] Price, S. and Wilson, L. M. (2016). *Pathophysiology. Clinical Concepts of Disease Processes*. St. Louis: Mosby Year Book. Inc.

[63] Pratiknya, A. W. (2016). *Dasar-Dasar Metodologi Penelitian Kedokteran Dan Kesehatan*. Jakarta: PT. Raja Grafindo Persada.

[64] Alderman, L (2016). *Proper Breathing Techniques*. Retrieved February 10, 2017 from http://www.betersairways.com.

[65] Rahmawati, R. (2016). *Perlu Terapi Efektif*. Retrieved February 10, 2017 from http://www.kompas.com.

[66] Respiratory Team. (2016). *Breathing Techniques and Position to Help Reduce Breathlessness*. Retrieved February 10, 2017 from http://www.salisburyhealthcare.org. Wiltshire: Salisbury Healthcare Scientists

[67] Rasmin, M. and Wihastuti, R. *et al*. (2014). *Diagnostik Dan Terapi; Prosedur Tindakan Bidang Paru Dan Pernapasan*. Jakarta: Bagian Pulmonologi FKUI.

[68] Ruane, L. E. (2014). *Global Initiative for COPD*. Retrieved February 10, 2017 from http://www.goldcopd.org, pp. 3-5.

[69] Saetta, M. *et al*. (2001). Cellular and Structural Bases of Chronic Obstructive Pulmonary Disease. *American Journal of Respiratory and Critical Care*, vol. 163, issue 6 pp 116 -127

[70] Sastroasmoro, S. and Ismael, S. (2016). *Dasar-Dasar Metodologi Penelitian Klinis* (2nd ed.). Jakarta: Sagung Seto.

[71] Shea, J. and Martinez, C. A. (2016). *Pulmonary Critical Care Associates of East Texas*. Retrieved
February 10, 2017 from http://www.pcca.net.

[72] Sitorus, R. (2014). Panduan Penyusunan Dan Penulisan Tesis Dan Disertasi. (Program Pascasarjana, Fakultas Ilmu Keperawatan UI, 2014).

[73] Smletzer, S. C. and Bare, B. G. (2015). *Brunner & Suddarth's: Textbook of Medical Surgical Nursing*. Philadelphia: Lippincott.

[74] Spahija, J., Marchie, M. and Grassino, A. (2015). Effects of Imposed Pursed Lips Breathing on Respiratory Mechanics and Dyspnea at Rest and During Exercise in COPD. *Chest*, vol. 128, pp. 640-50.

[75] Kardjito, T. and Hariadi, S. (2016). Epidemiologi Penyakit Patti Obstruktif Menahun. Dalam: Simposium dan Kursus Penyakit Paru Obstruktif Menahun. *Surabaya Juni*, vol. 2, pp. 117.

[76] Tiep, B. L., *et al*. (2016). Pursed Lips Breathing Training Using Ear Oximetry. *Chest*, vol. 90, pp. 218-221.

[77] Troosters, T., *et al*. (2000) *Pulmonary Rehabilitation in Chronic Obstructive Pulmonary Disease*. Retrieved February 12, 2017 from http://www.atsjournals.org.

[78] Spengler, C. M., *et. al*. (2015). *Respiratory Training*. Retrieved from http://www.pponline.co.uk/encyc.

[79] Sudoyo, A. W., *et al*. (2009). *Buku Ajar Ilmu Penyakit Dalam Jilid II* (5th ed.). Jakarta: Interna Publishing.

[80] Sugiyono, P. (2015). *Statistik untuk Penelitian*. Bandung: CV. Alfabeta.

[81] Thomas, M., *et al*. (2016). Breathing Retraining for Dysfunctional Breathing in Asthma: A Randomised Controlled Trial. *BMJ Publishing Group & British Thoracic Society*, issue 58, pp. 110-115.

[82] Timby, B. K., Scherer, J. C. and Smith, N. E. (2016). *Medical Surgical Nursing: Introductory* (7th ed.). Philadelphia: Lippincott.

[83] Tomey, A. M. (2016). *Nursing Theorists and their Work*. (6th ed.). Philadelphia; Mosby Elseiver.

[84] Weiner, P and Mc Connell, A. K. (2005). *Respiratory Muscle Training in Chronic Obstructive Pulmonary Disease: Inspiratory, Expiratory, or Both?*. Retrieved February 25, 2018 from http://www.medscape.xom/viewarticle/499951.

[85] Yunus, F. (2017). Penatalaksanaan Penyakit Paru Obstruksi. *Cermin Dunia Kedokteran*, issue 114, pp. 20-32.